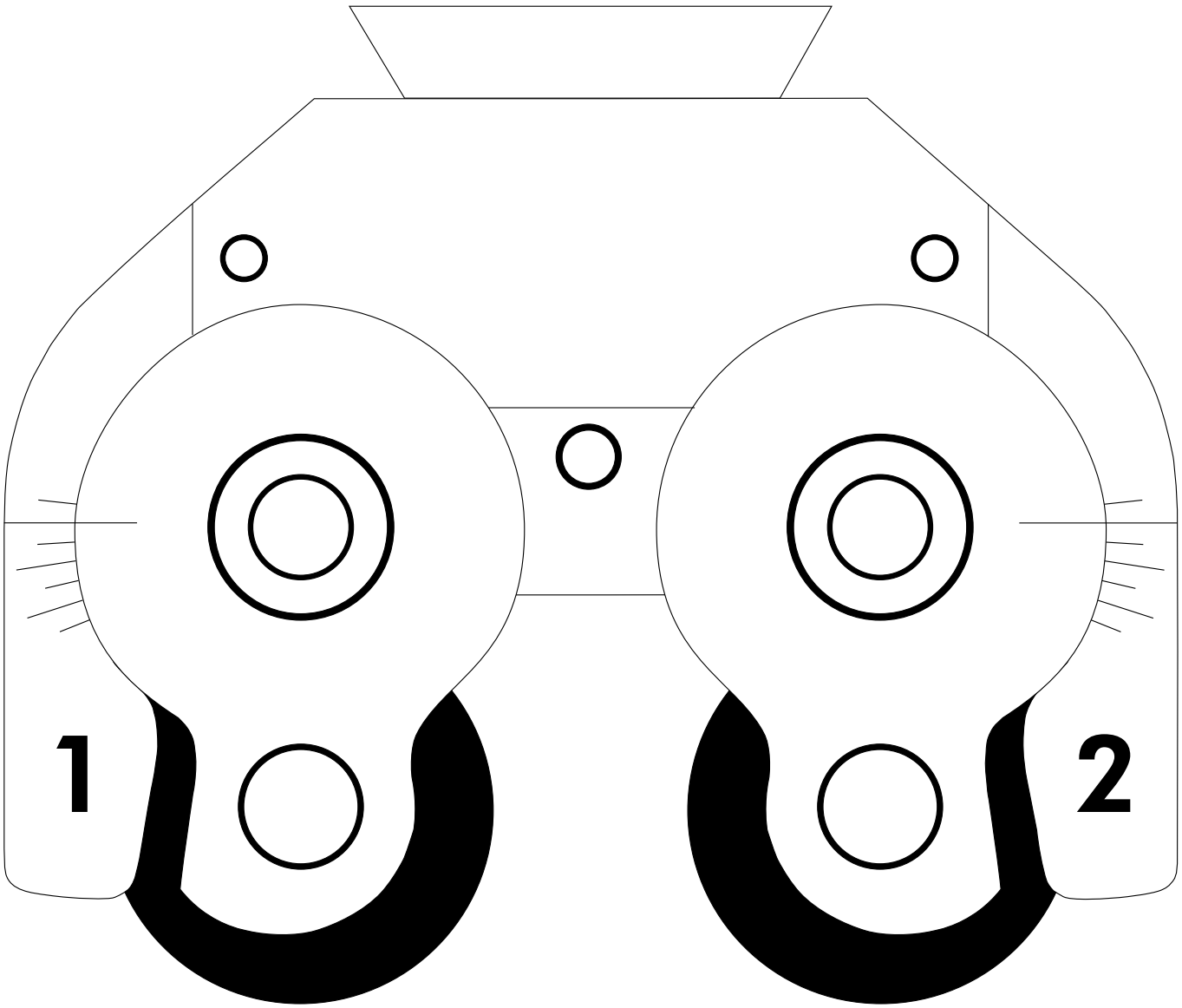
FLOYD

THE TOOLING SPECIALISTS FOR PRECISION COMPONENT MACHINING

Operating Instructions

Thread Rolling Attachments



WAGNER® WERKZEUGSYSTEME MÜLLER GMBH

Important information on commissioning and initial operation

Before using your thread rolling attachment for the first time, please read the operating instructions and follow the safety instructions!
You should, at the very least, have worked through the following chapters:
Chapter 6: Preparation for thread rolling (page 25) and
Chapter 9: Thread Rolling (page 38).

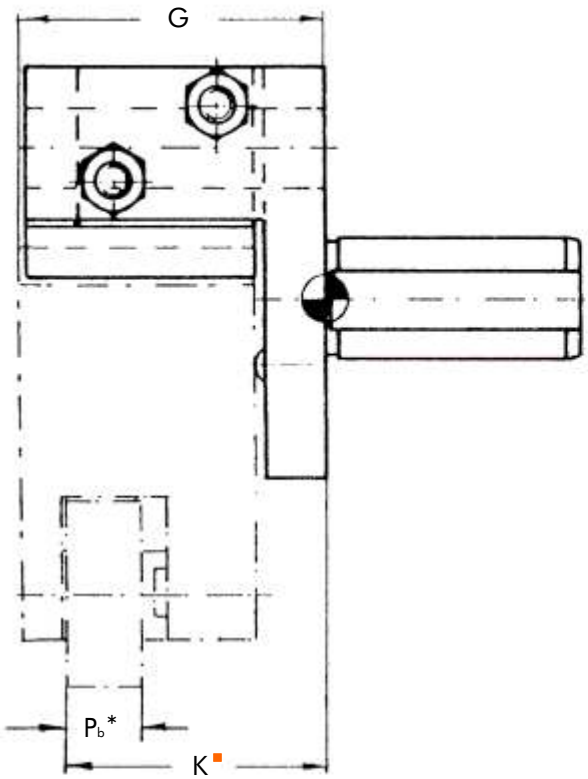
For setting up the WAGNER® Thread Rolling Attachment on your machine, all you require is the calculation sheet and a drawing of the workpiece you wish to produce.

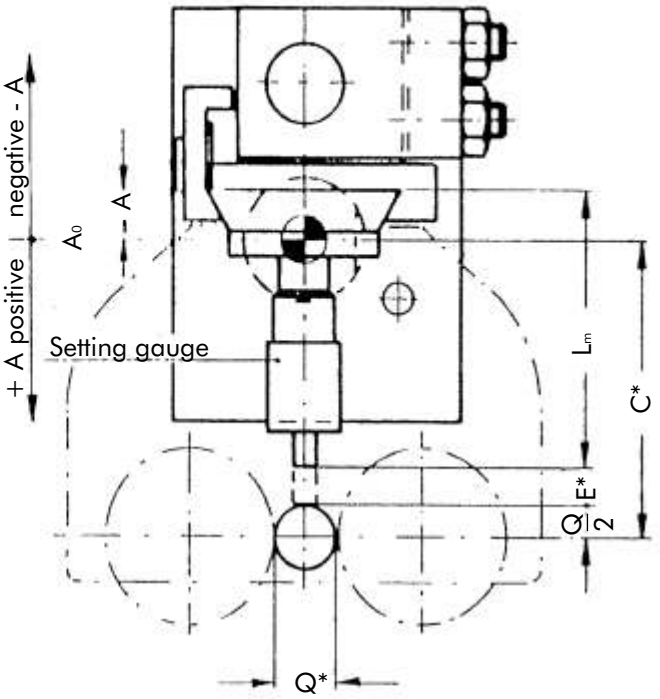
Below is an **explanation of some of the terms** used in the calculation sheet. The page numbers refer to the detailed description provided in the operating instructions.

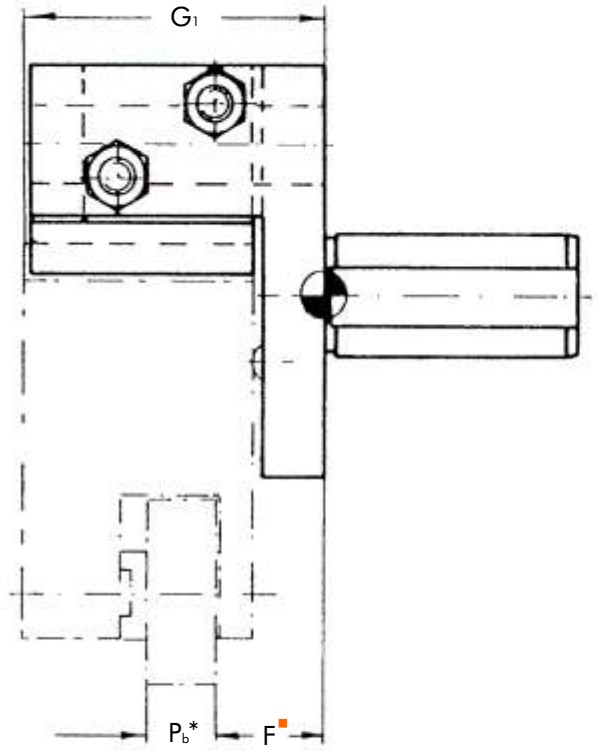
Calculation sheet no.:	For archiving purposes.
Customer no.:	Your customer number with us. Please state in all enquiries/ orders.
Adapter no.:	Item number of the adapter, based on the machine type and the turret or slide used. We investigate this number, which can be found in the annexes' tables.
Roll type and profile width:	They are determined by the type of machining work required, space conditions and economic factors.
Thread:	Please note: The roll must only be used to produce this one thread.
Tolerance zone, screw thread:	According to the workpiece drawing. If no specification is available, always 6 g (as per DIN).
Max./ min. dimension:	From the limiting tables of the applicable standard.
N, S, E, B and B + Z:	Information from the range tables, depending on the relevant thread and tool type.
W:	Number of required workpiece revolutions. Must be adhered to without fail!
Q:	Mean value d_2 of the effective diameter. It offers a guide line value for the pre-machining diameter. The pre-machining diametercan vary depending on the material used.
n:	Targeted revolutions. A roll speed of 50-60 m/min results in $n = \frac{V \cdot 1000}{d \cdot \pi}$
n_R:	From n_R = 600 rpm, thread rolls with bronze bushes or bronze roll pins must be used. $n_R = \frac{\text{Speed of workpiece}}{\text{Number of thread starts}}$
Special setting values:	For application on CNC machines.

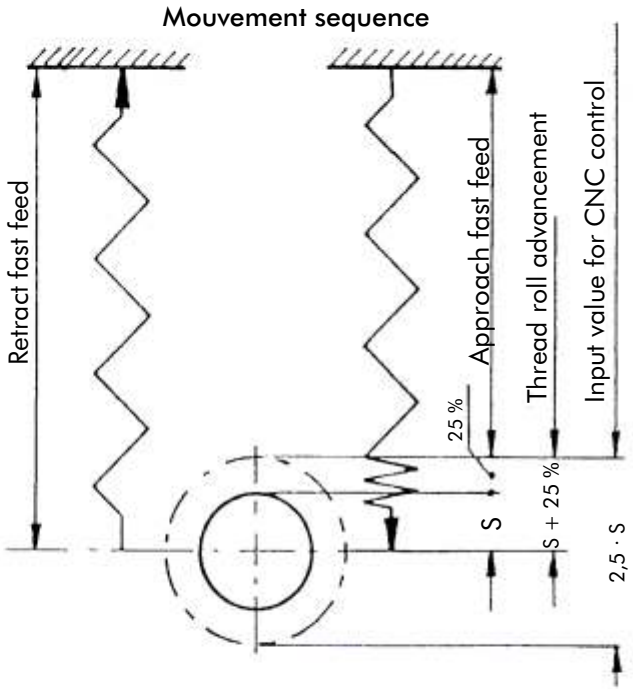
For programming measurements, required for the application of thread rolling attachments on CNC machine tools, see the calculation sheet an the attached sheet on programming dimensions. These are standard values and must be checked and corrected if applicable.

Programming Dimensions









Type	L_m	G	G_1	F	K
B 8-W	41.4	61.7	64.5	31.7	51
B 10-W	55.9	72.9	75.7	31	61
B 13-W	64.9	87	87	34.2	73.8
B 15-W	59.5	87	87	34.2	73.8
B 18-W	74.5	99	99	36.2	82.8
B 36	86.4				

$C = \frac{Q}{2} + E + Lm + A$

= Basing point

(*)= These dimensions: see evaluation sheet

■ The dimensions F and K do not apply for all types of rolls. Please check them during setting-up and transfer them into the control system.

Calculating sheet-no.	**Worpiece/sketch No.**

Instruction manual page

Customer: Customer-no. :

Adaptor-no.:

Machine:

Slide: Turret :

Tool size:

12 Type of roll: Profile width(Pb) :

Thread:

Material:

Thread dimensions	external thread/tolerance		max. size	min. size	medium value d2
	External dia. d				
	Pitch dia. d2				**Q =**
	Core dia. d3				

Data for thread rolling

Instruction manual page

8 , G1...	Nomber of starts on rolls		N =	
19 , G1...	Roll advance		S =	mm
8 , G1...	Setting value (on thread roll engraved)		E =	mm
8 , G1...	Shoulder dia.max. (without modification)		B =	mm
8 , G1...	Shoulder dia.max. (with modification)		B+Z =	mm
20	Required revolutions of workpiece		W =	
	Blank dia. (medium value d2)		Q =	mm
	Rev. p. m. of spindle		n =	min^{-1}
18	Roll speed		V =	m/min
14	Rev. p. m. of thread rolls **note max Rev. p. m.!**	$n_R = \frac{n}{N}$	n_R =	min^{-1}

Calculation of feed

Instruction manual page 21	Feed	V_u=S/W	=	mm/rev of spindle
	Feed hydraulic	V_m=S*n/W	=	mm/min
Attention!	Feed stroke = work stroke S+25% security		=	mm
	Feed adjustment for hydr. feed according			
	Measuring X (mm)	X*60*W/S*n	= **-**	seconds
	Presumed measuring stroke X = _____ mm			

Special setting values	Dimensional micrometer setting at "0" (Lm):	=	mm
	Dimension A (for NC Adaptor)	=	mm
NC-sheet	Dim. C (for NC Adaptor) = Lm + E + Q/2 + A	=	mm

(Dimension "C" assists the toolcorrection. Definate dim.must be checked in the machine by means micrometer setting and corrected if necessary.)

Instruction manual page 41	Measuring location y for taper threads	=	mm

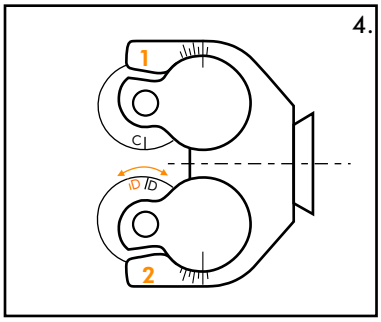
Remarks:

Date: Name:

Wagner Werkzeugsysteme
Gutenberg-Str.4/1
D-72124 Pliezhausen
Telefon (0 71 27) 973-300
Telefax (0 71 27) 973-390

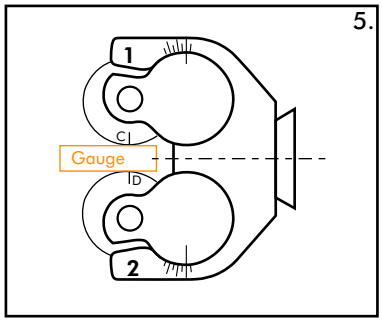
Changing thread rolls

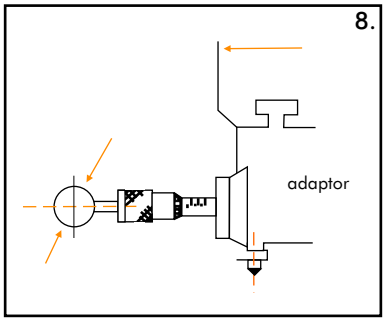
a) Changing rolls for similar threads



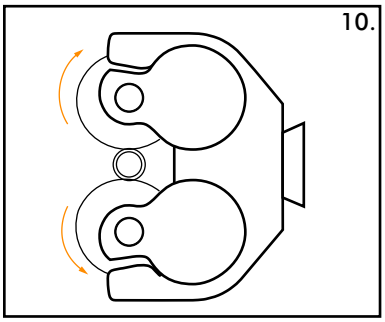
1. Take the tool out of the machine without the adaptor.
2. Open the cover of the tool's gear unit ▸ **see page 26**.
3. Remove the springs, the adjusting spindle and the medium gear-wheel ▸ **see page 26**.
4. Replace the thread rolls:
   Side 1 = Roll C
   Side 2 = Roll D
   ▸ **see page 26**.
5. Synchronise the thread rolls and reintegrate the gear- wheel, the adjusting spindle and the springs
   ▸ **see page 29**.
6. Make sure that the thread rolls and the gear can be easily moved. The rolls must be rotary without braking resistance. The axial clearance mus not be greater than 0.07 mm
   ▸ **see page 40**.
7. Reintegrate the tool into the machine's adaptor at the exact position (z-direction).

b) Changing rolls for different threads





1. Take the tool out of the machine without the machine's adaptor. The adaptor remains attached.
2. Open the cover of the tool's gear unit ▸ **See page 26**.
3. Remove the springs, the adjusting spindle and the medium gear-wheel ▸ **see page 26**.
4. Release the roll bolt and replace the thread rolls:
   Side 1 = Roll C
   Side 2 = Roll D
   ▸ **See page 26**.
5. Loosen the geared arm's clamping screws Set new thread diameter (core diameter of the thread) by means of the adjust gauge (gauge block). Tighten the clamping screws
   ▸ **See page 27**.
6. Synchronise the thread rolls and reintegrate the gear-wheel, t he adjusting spindle and the springs ▸ **See page 29**
7. Make sure that the thread rolls and the gear can be easily moved. The rolls must be rotary without braking resistance. The axial clearance mus not be greater than 0.07 mm
   ▸ **see page 40**.



8. Define a new z-position and reintegrate the tool into the adaptor. In case of thread rolling close to a collar, take care of the maximum shoulder diameter and make sure that the thread roll's face surface has a minimum distance of 0.3...0.5 mm to the collar on the workpiece!
9. Adjust the attachment to »center of the workpiece« in x-direction ▸ see page 34.
10. Set the adaptor pendular adjustment ▸ see page 37.

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A. Preface

Dear customer,

congratulations on the purchase of this WAGNER® product! You bought a high-quality commodity, which facilitates effective and economic operation. Our Thread Rolling Attachments are known for their high quality and long-life cycle. We hope that you are fully satisfied with our products.

This manual is made to help you taking the first steps with your new WAGNER® product, explain the operation and point out possible hazards.

After-Sales Service:

If you need further advice, training or ulterior help or if you are not satisfied with your WAGNER® product, please contact us!
Our sales team is at your disposal.

CAUTION: Please implicitly read the operating instructions before initial operation and follow the safety instructions!

The contents of this manual should be read, understood and followed in every aspect by everybody involved. This is especially true for the safety instructions and notes on hazards found throughout this manual (see chapter B. »Safety instructions«).
Following these instructions will help avoid accidents, mistakes and malfunctioning.
This documentation includes all information necessary for using and maintaining your WAGNER® Thread Rolling Attachment. The documents are up-to-date at the time the product was manufactured.
Use only these documents when working with the Thread Rolling Attachment.
WAGNER® WERKZEUGSYSTEME MÜLLER GmbH reserves the right to make technical changes to improve the product, if and when appropriate.
If the instructions in this manual are not followed, and this negligence results in mistakes, damages, loss of production, etc., WAGNER® WERKZEUGSYSTEME MÜLLER GmbH will not be responsible for any subsequent damages.
Due to copyrights, we must point out that this manual is for internal use only. Providing this manual to third parties is prohibited.

»Regulations for the prevention of industrial accidents«

During operation, maintenance and repair the respective national and international »regulations for the prevention of industrial accidents« apply in addition to the previously listed instructions. The operating instructions, particularly the chapter »Safety instructions«, has to be read in any case. Following the safety instructions and legal regulations helps to prevent doing damage to persons, machines and our product.

Warranty

In case of buying and using *original* WAGNER® spare parts and accessories, we guarantee proper operation of the Thread Rolling Attachment.

We exclude any warranty for damage of persons, machines and our products, in case of:

- improper mounting and operating
- using no original spare parts
- removing components and assemblies
- arbitrarily modifying our products
- using broken rolling attachments.

When using accessories which are not made by WAGNER® or explicitly approved by us, we exclude any warranty.

Generally, we are not liable for damages of all kind caused by removing safety equipment on the machine. We imply that our products are only set up on technically proper operating machines.

Limited liability:
CAUTION: Do not use this product for any other purpose than its designated use!
Follow the safety instructions and notes on hazard!
Using the product only by trained specialists, otherwise its use may constitute a risk to life and limb of the user and cause damage to material property. For such cases, the manufacturer declines all responsibility.

Specified operation

CAUTION: Do not use this product for any other purpose than its designated use! Follow the »safety instructions and notes on hazards«!
This product should only be used by trained specialists, otherwise its use may constitute a risk to life and limb of the user and cause damage to material property. For such cases, the manufacturer declines all responsibility.
Do not use force when mounting, demounting and operating. You could otherwise damage the attachment or the machine.

Initial Operation

Please carry out an operational check before initial operation of the Thread Rolling Attachment.

B. Safety instructions

Following the safety instructions and the notes on hazard makes sure that the Thread Rolling Attachments are used securely.

- Persons in charge of operating, maintaining and repairing always have to read and understand the manual and the safety instructions. People who are under the influence of alcohol and/ or drugs may cause accidents!

- When mounting, please bear in mind the weight of the thread rolling attachment and, if necessary, lift by means of a lifting equipment.

- Take care that the cutting sides between the attachment and the machine are clean. Dirt may affect the precision of the workpiece.

- Generally, shut down the machine at the main switch when mounting the attachment. Make sure that the spindle cannot start unexpectedly when exchanging the rolls.

- Remove all tools and inspection equipments from the working chamber of the machine before setting into operation. There is a risk of injury by centrifuging tools and euipment!

- Close the safety gate or protection cover before operating! Hurtling chips and broken attachments or workpieces may cause damage to people and machines.

- Make sure that the Thread Rolling Attachment cannot disengage during operation.

- When closing the Thread Rolling Attachment do not touch the head, do not touch rotating tools: risk of injury!

- Please check and handle the thread rolls extremely carefully. The rolls have square edges. If necessary, wear safety gloves!

- Please make sure the Thread Rolling Attachment is protected and fastened appropriatly when transporting.

1.0 Basic Equipment

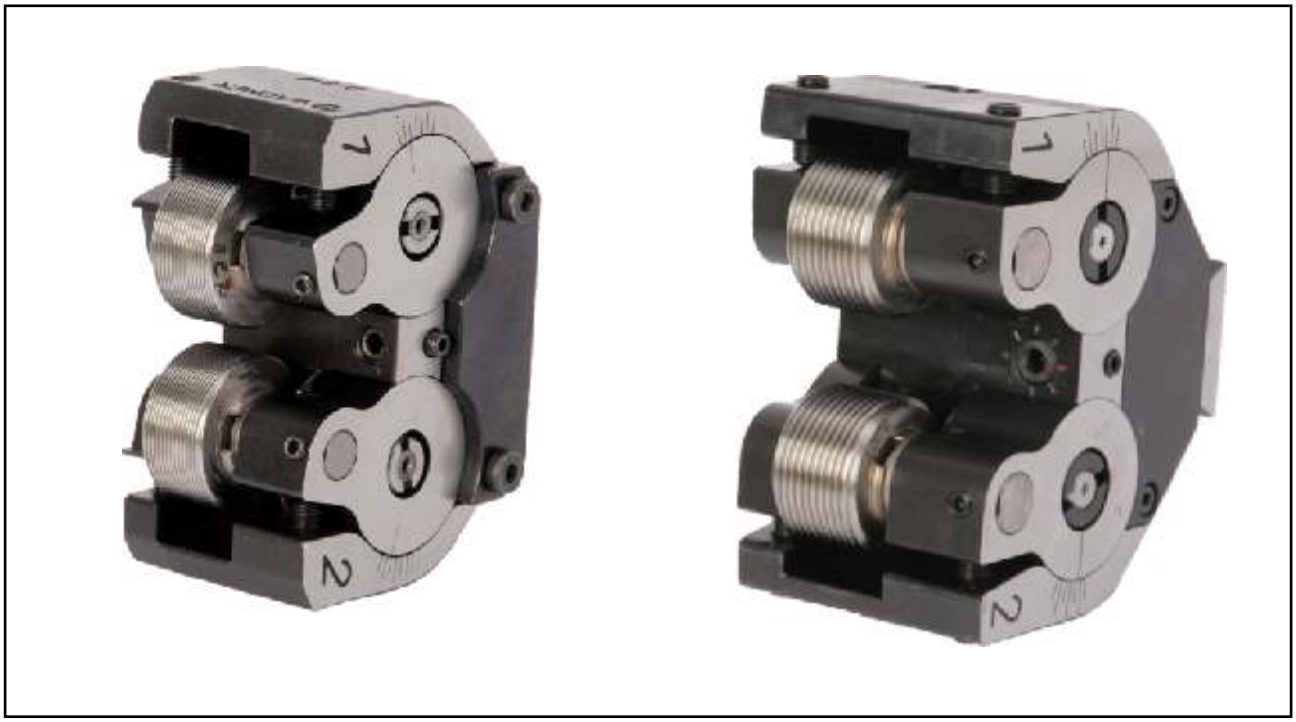
1.1 Sizes

With this Thread Rolling Attachment, you will produce external threads of highest surface quality in record times. Due to their non-interrupted fibre course, the rolled threads are build for greatest strains.

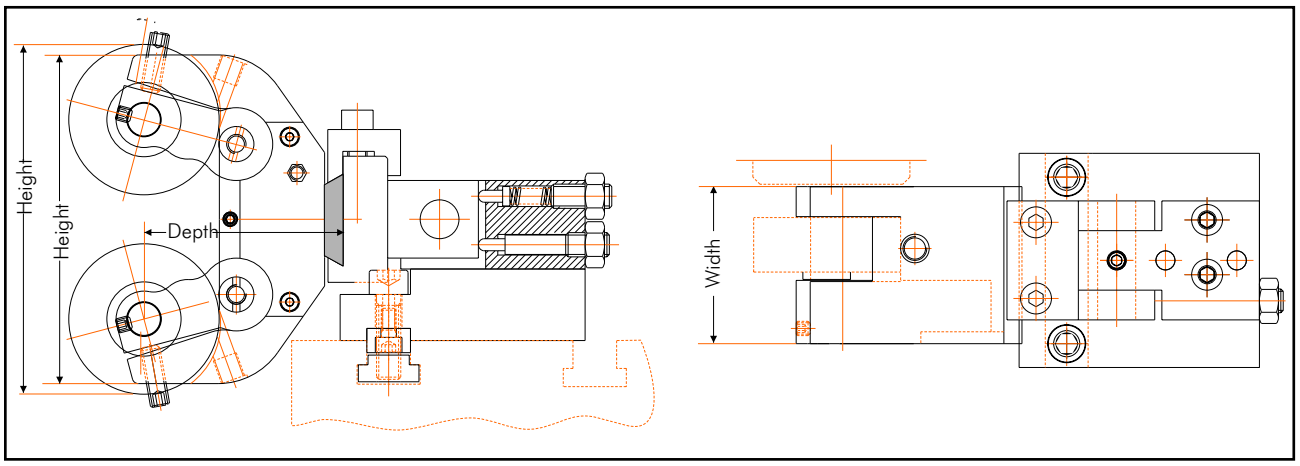
The thread rolls
are built to the thread that is to be produced, in diameter, angle and form. Every pair of rolls is designed for one thread measure. The material and the production of our thread rolls has been developed for the special requirements of the non-cutting technology.

The adaptor
is the component between the Thread Rolling Attachment and the tool machine. The prism clamping enables a fast exchange of tools. The exact positioning of the Thread Rolling Attachment allows automatic focusing on the centre of the workpiece.

WAGNER® thread rolling attachments are available in **seven standard sizes** and designed to permit the machining of an outstandingly wide diameter range with each of the offered attachments.



1.2 Survey of technical data

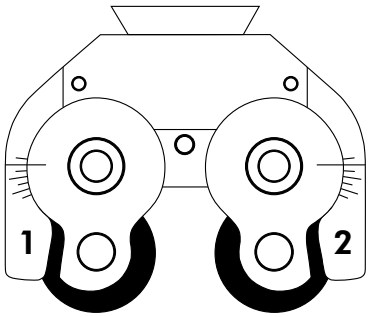


A Thread Rolling Attachment on a cross slide

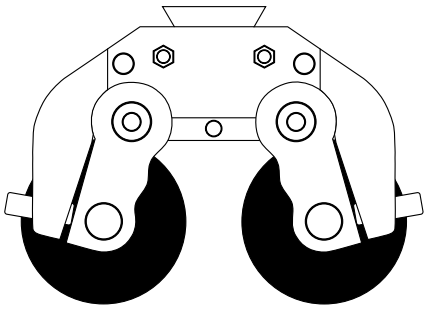
Type	Metric Norm Thread Desired-Ø	Metric Fine Thread Desired-Ø	Thread length max.	Weight kg Tool with rolls	Weight kg Adaptor	Max. Feed force N	Dimensions Width	Dimensions Height	Dimensions Depth
B 8-W	1.6 - 12	2 - 13	14	1.0	ca. 1.5	1600	36.6	76.2	47.5
B 10-W	2 - 16	3 - 16	19	2.1	ca. 1.7	2490	50	92	65
B 13-W	3 - 22	3 - 30	25.5	3.8	ca. 2.0	4890	66	114	79.5
B 15-W	6 - 22	6 - 45	25.5	4.5	ca. 2.0	5700	66.2	135 up to 147	83.4
B 18-W	6 - 27	6 - 42	32	7.0	ca. 3.0	6230	79	156	95.5
B 36	8 - 33	8 - 56	32	11.5	ca. 4.5	9790	90	200	115

Measures in mm

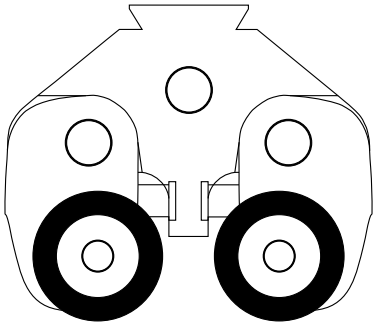
2.0 Capacity Of The Thread Rolling Attachment



WAGNER®- Thread Rolling Attachment standard design



Design with omitted head body



Design with porched rolls

Thread rolling attachments are used primarily on CNC or cam-controlled single or multiple-spindle lathes. They also have other uses in the special machine sector.

The most common **fields of application** for WAGNER® thread rolling attachments are:

- Threads behind a collar
- Threads close to a collar
- Very short threads
- Threads with a very short run-out
- In case axial machining is not possible due to lack of space
- In case, the end of the workpiece is not free

2.1 The method

The thread is produced by cold forming. Proceeding from a mean diameter, the root of the thread is impressed and the displaced material is forced outward to form the crest.

The thread rolling attachment is mounted on the machine tool holder, a cross slide for example, by means of the adapter. It is moved against the rotating work at a constant feed rate. The thread rolls, which are synchronized by means of a gear chain, are set in rotation as the tool holder continues to advance. As soon as the thread rolls are on the centre line of the work, the rapid return motion is initiated and the work is released.

Only a few revolutions of the work are needed for rolling the thread. The exact number of work revolutions depends on the thread pitch, the material and the size of the tool. The flow of the fibers within the thread profile is not interrupted, so that the notch

The method

effect is minimized. The surface of the thread is compacted and the thread flanks become burnished. Threads produced by the thread rolling process are characterized by high fatigue strength, wear resistance and corrosion resistance.

The following characteristics are also typical of rolled threads:

- Rolling times are shorter and thus production rates are higher than with other thread-making methods, and the threading time does not determine the cycle time.
- The feed rate of the thread rolling attachment is in a definite relation to the spindle speed so that the attachment may be operated at the same speed as the other operations.
- The type and size of thread are determined by the use of appropriate thread rolls.

2.2 Applicability

We recommend as a general rule always using the biggest rolling attachment that will fit on your machine. This ensures that the greatest possible working range of the machine can be utilized if you ever have to change over for different machining processes.

In determining the suitable rolling attachment size, please take the following points into consideration:

1. The rollability of the material (page 8)
2. The working range of the rolling attachment in view of the thread and shoulder diameter measurements (pages G1 to G ..., see annex)
3. Length of the thread you wish to produce (page 9)
4. Removal of the thread from the collet (page 10)
5. Selection of thread rolling roll type (page 11-12)
6. Machine tool on which you wish to use the thread rolling attachment (pages A-S and A-NC, see Annex)

We will deal with these different selection criteria more detailed in the following. Before reaching a final decision, we would recommend that you call back, as we will look into your machining application and work out the best solution in conjunction with the machine tool producer.

Rollable Material

δ_5 determines the material's elongation.

The material used must be cold-formable.
In the case of V-threads, the elongation δ_5 should not be greater than 7% and in the case of Acme standard screw threads and not less than 12%. For standard threads, it is possible to roll materials with strengths of up to appr. 800 N/mm².
Fine threads can also be produced at up to 1000 N/mm², provided δ_5 is sufficiently high. High-strength, low-elongation tempered steels are not, as a rule, capable of being rolled. Free-cutting brass (MS 58) is not usually suitable for thread rolling.

Working ranges and max. collar diameter

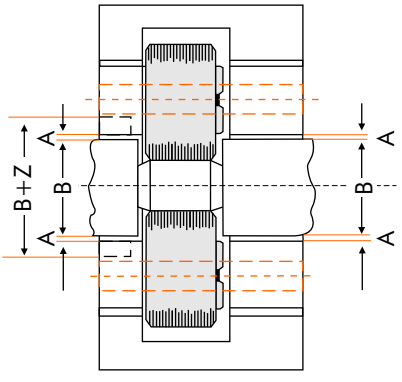
The collar diameter is dependent on the thread you wish to roll, and the necessary thread roll diameter. This depends not only on the thread diameter but also on the size of the attachment.
In the working range table G1 to G1... (see Annex), the symbols used have the following meaning:

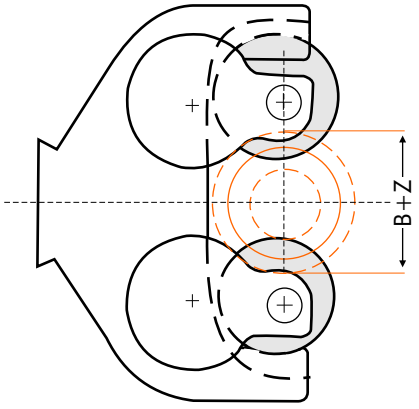
N = Number of thread starts on the thread roll
B = Maximum collar diameter (without modified thread rolling attachment arms)
B+Z = Collar diameter with modified arms
S = Thread roll advancement (page 21)
E = Setting value for micrometer setting gauge
A = Minimum clearance

Type	Z	A
B 8-W	—	0.4 mm
B 10-W	5.6 mm	0.8 mm
B 13-W	6.1 mm	0.8 mm
B 15-W	—	0.8 mm
B 18-W	6.9 mm	0.8 mm
B 36	6.9 mm	0.8 mm
B 44	6.9 mm	

The **solid** arms can be replaced if required by modified arms. In this case, measurement B is increased by the dimension Z.
In this case, it is necessary to replace the axial thrust bearing by a collar bush.

If modification is necessary, we recommend to ask our technical advisory service.





2.3 Greatest rollable thread length

The greatest rollable thread length is specified in the table of guideline values on pages 9 and 10. The maximum length can only be achieved if thread rolls with a recessed drive slot are used (see page 13, shape D).

In addition, the deforming force incurred during the thread rolling process must not exceed the load limit of the rolling attachment. When processing materials with higher strengths, and when producing relatively coarse thread profiles, the thread length which can be produced is restricted. Guideline values for the greatest rollable thread length

The thread dimensions marked below with a »•« can be produced in the length specified on page 5, provided the attachment does not bend away under the influence of the feed force.

Thread diameter up to (mm)	Thread pitch up to (mm)	B 8-W			B 10-W			B 13-W		
		Brass/ aluminium alloys	Steel up to 700 N/ mm²	Steel* up to 900 N/ mm² stainless steel	Brass/ aluminium alloys	Steel up to 700 N/ mm²	Steel* up to 900 N/ mm² stainless steel	Brass/ aluminium alloys	Steel up to 700 N/ mm²	Steel* up to 900 N/ mm² stainless steel
4	0.7	•	•	•	•	•	•			
5	0.8	•	•	12	•	•	•	•	•	25
6	1	•	•	11	•	•	14	•	•	24
8	1	•	•	11	•	•	12	•	•	24
	1.25	•	•	11	•	•	12	•	•	22
10	1	•	12	11	•	•	12	•	•	22
	1.5	•	11	10	•	•	11	•	•	20
12	1	•	12	10	•	•	12	•	•	20
	1.5	•	12	10	•	•	12	•	•	19
	1.75	•	11	8	•	11	8	•	•	18
14	1				•	16	11	•	•	19
	1.5				•	14	10	•	•	18
	2				•	12	8	•	•	16
16	1				•	16	11	•	•	19
	1.5				•	14	10	•	•	18
	2				•	12	8	•	•	16
18	1				•	16	11	•	•	19
	1.5				•	14	10	•	•	18
	2							•	•	16
	2.5							•	20	14
20	1							•	•	18
	1.5							•	22	16
	2							•	20	14
	2,5							20	18	12
22	1							•	22	16
	1.5							•	20	14
	2							20	18	12
	2.5							18	16	
30	1.5							22	16	10
	2							18	12	
32	1.5							22	16	
	2							18		

* Higher strengths on request

▶ For B 15-W to B 36, see overleaf

Greatest rollable thread length

The thread dimensions marked below with a »•« can be produced in the length specified on page 5, provided the attachment does not bend away under the influence of the feed force.

Thread diameter up to (mm)	Thread pitch up to (mm)	B 15-W			B 18-W			B 36		
		Brass/ aluminium alloys	Steel up to 700 N/ mm²	Steel* up to 900 N/ mm² stainless steel	Brass/ aluminium alloys	Steel up to 700 N/ mm²	Steel* up to 900 N/ mm² stainless steel	Brass/ aluminium alloys	Steel up to 700 N/ mm²	Steel* up to 900 N/ mm² stainless steel
6	1	•	•	•	•	•	•	•	•	•
8	1	•	•	•	•	•	•	•	•	•
	1.25	•	•	•	•	•	•	•	•	•
10	1	•	•	•	•	•	30	•	•	•
	1.5	•	•	•	•	•	28	•	•	•
12	1	•	•	•	•	•	30	•	•	•
	1.5	•	•	24	•	•	28	•	•	•
	1.75	•	•	22	•	•	26	•	•	•
14	1	•	•	•	•	•	28	•	•	•
	1.5	•	•	23	•	•	26	•	•	•
	2	•	•	19	•	•	24	•	•	29
16	1	•	•	•	•	•	26	•	•	•
	1.5	•	•	22	•	•	24	•	•	29
	2	•	•	18	•	29	22	•	•	27
18	1	•	•	•	•	•	24	•	•	29
	1.5	•	•	21	•	29	22	•	•	27
	2	•	25	17	•	27	20	•	•	26
	2.5	•	22	16	•	26	19	•	•	25
20	1.5	•	•	20	•	29	22	•	•	27
	2	•	24	17	•	27	20	•	•	25
	2.5	•	20	15	•	26	19	•	•	24
24	1.5	•	25	18	•	29	20	•	•	25
	2	•	22	16	•	27	19	•	•	24
	3				•	25	18	•	•	23
27	1.5	•	24	17	•	25	19	•	•	25
	2	•	21	15	•	24	18	•	•	24
	3				•	22	16	•	•	23
30	1.5	•	23	16	•	25	18	•	•	24
	2	•	20	14	•	24	17	•	•	22
	3				•	22	16	•	•	20
36	1.5	•	20	15	•	24	17	•	•	24
	2	•	18	13	•	22	16	•	•	22
	3				•	20	15	•	•	20
42	1.5	•	20	15	•	24	16	•	•	22
	2	•	18	13	•	22	15	•	29	20
	3				•	20	14	•	27	19
50	1.5							•	29	22
	2							•	27	21
	2.5							•	26	20
	3							•	25	19
60	1.5							•	27	20
	2							•	26	19
	2.5							•	25	18
	3							•	24	17

* Higher strengths on request

2.4 Minimum distance

The minimum distance determines the distance from the front edge of the chuck head to the first complete thread. It requires aroll chamfer of 60°.

Pitch	B 8-W		B 10-W	B 13-W B 15-W	B 18-W	B 36	B 44
	1)	2)					
0.45 0.5 0.6	7.7 8.0 8.0	6.2 6.5 6.5					
0.7 0.8 1	8.2 8.5 8.7	6.7 7.0 7.2	11.7 11.9	14.8 15.3	17.8 18.3	22.9 23.4	
1.25 1.5 1.75	9.0 9.2 10.0	7.5 7.7 8.5	12.2 12.5 13.2	15.5 15.8 16.3	18.6 18.8 19.3	23.7 23.9 24.4	
2 2.5 3	10.3		13.2	16.5 17.3	19.6 20.3 21.4	24.7 25.4 26.4	

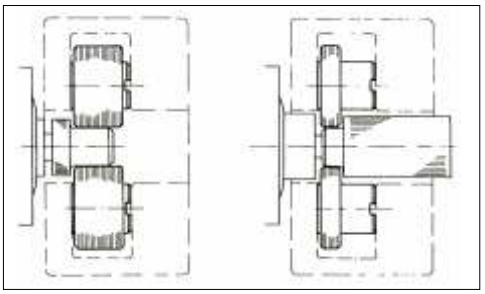
1) With chuck head diameter over 31.75 mm.
2) With chuck head diameter below 31.75 mm.

3.0 The Rolls

It is generally true to say that the roll diameter is dependent on the thread diameter you wish to roll and on the tolerances which have to be adhered to. If customer drawings are submitted, which contain no specification of thread tolerance, we assume on the basis of the valid standard that DIN threads are produced to 6 g (for Acme threads 7 e), i.e. to »medium« tolerance, or in the event of UN threads, to 2 A.
Should other dimensions be required, these must be submitted in the form of a drawing, or clearly stated in the order, as correctly dimensioned rolls are essential if optimum tool life is to be achieved.

3.1 Roll shapes and application criteria

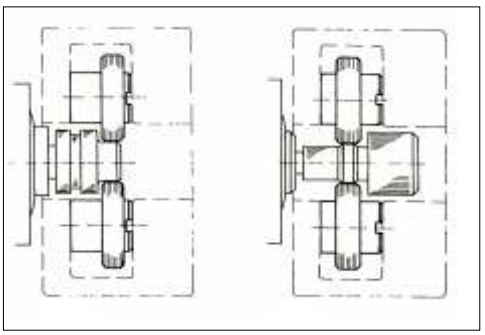
Depending on the required application, differently shaped thread rolls can be used. The D shapes cannot be produced for all types of threads (see work range tables G1 to G... in the Annex).



Thread rolls C-1 and C-2

C-1 Roll
Roll with standard working face; forms the basic version of all thread rolls.

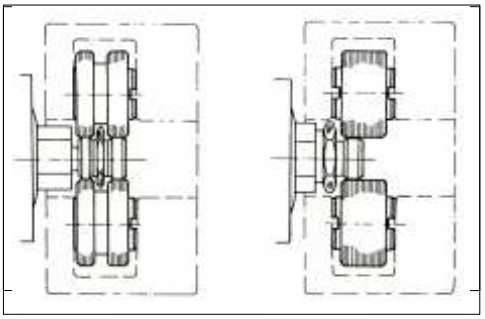
C-2 Roll
For the production of short threads behind the collar (on the cut-off side).



Thread rolls C-3 and C-4

C-3 Roll
Here, the thread rolling attachment is required to be mounted as close as possible towards the collet on the cross side.

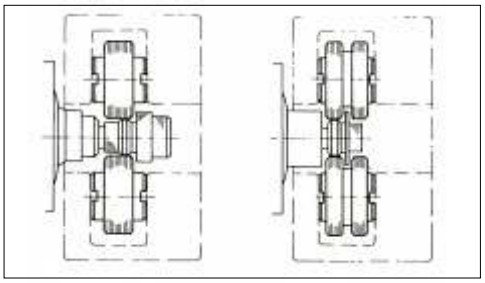
C-4 Roll
In the application example depicted here, a certain clearance is required between the attachment and the collet face. In addition, the thread roll is prevented from making contact with the surface to the left of the thread.



Thread rolls C-5 and CR-1

C-5 Roll
Two threads of the same dimensions can be machined at the same time.

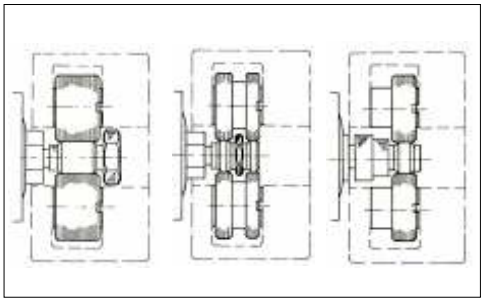
CR-1 Roll
For manufacturing of short rolls. Double tool life due to reversible design of the rolls.



Thread rolls CR-4 and CR-5

CR-4 Roll
For the manufacture of short threads behind a collar. Double tool life due to reversible design of the rolls.

CR-5 Roll
For rolling a short thread behind a narrow collar. Double tool life due to reversible design of the rolls.

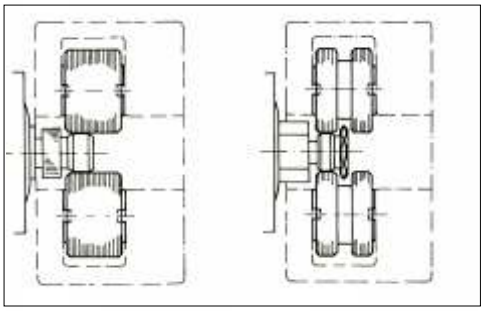


Thread rolls D-1, D-3 and D-5

D-1 Roll
A recessed drive slot permits a greater thread length on the workpiece than can be achieved using a C-1 roll.

D-3 Roll
In this application example, the thread rolling attachment has to be positioned closer to the collet face than would be possible with a C-3 roll.

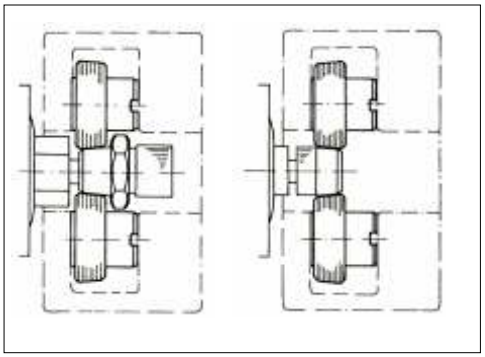
D-5 Roll
Two threads of the same dimension have to be rolled simultaneously. Using a C-5 roll, the required thread lengths are not achieved.



Thread rolls DR-1 and DR-5

DR-1 Roll
These rolls are used in cases you wish to be able to reverse the rolls to double the tool life. The width of the thread rolling profile is not sufficient with the CR-1 roll.

DR-5 Roll
Rolling a short thread behind the collar. You wish to be able to reverse the rolls to double the tool life. The width of the thread rolling profile is not sufficient with the CR-1 roll.



Thread rolls K-2 and Q-2

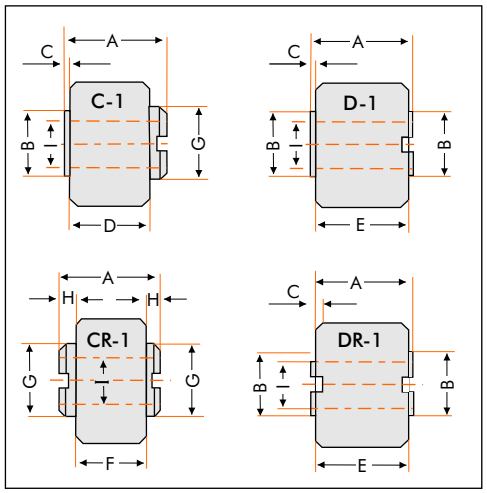
K-2-Roll*
Rolling taper threads on the cut-off side.

Q-2-Roll*
For rolling taper threads on the free end of the workpiece.

* The profile widths of rolls for .tapered threads are designed to comply with standardized thread reaches. If other thread reaches are required, a drawing must be provided which indicates the thread length and the position of the measurement surface (see also pages 38-39).

3.2 Thread roll dimensions

The dimensions for each roll form can be read in the follwing table:



	A	B	C	D	E	F	G	H	I
B 8-W	14.7	12.8	0.4	12.2	14.0	10.8	14.4	1.9	7.95
B 10-W	19.8	14.8	0.4	15.7	19.0	13.1	17.1	3.3	9.5
B 13-W B 15-W	26.3	20.0	0.4	22.6	25.5	19.6	21.8	3.3	13.5
B 18-W	32.6	23.2	0.4	28.4	31.8	25.9	25.2	3.3	15.9
B 36	32.6	27.4	0.4	28.4	31.8	25.9	30.1	3.3	20.7

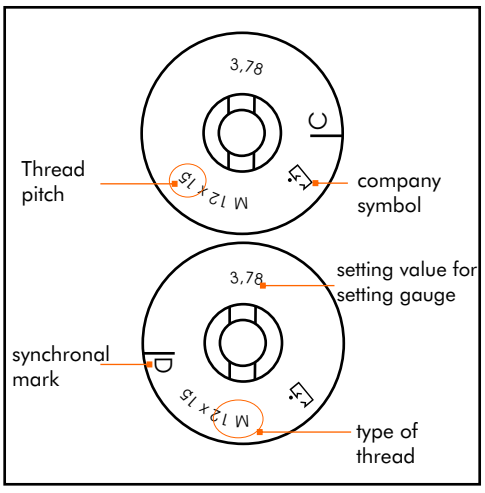
3.3 Thread roll bearings

Normally, the thread roll runs directly on the roll pin. However, for **thread roll speeds** in excess of 600 rpm, we recommend using thread rolls with bronze bushings or bronze roll pins.

$$\text{Speed of thread roll} = \frac{\text{speed of the workpiece}}{N}$$

N = number of thread starts on the thread rolls
(is specified in the work range tables G1 to G...)

3.4 Engraving of the thread rolls

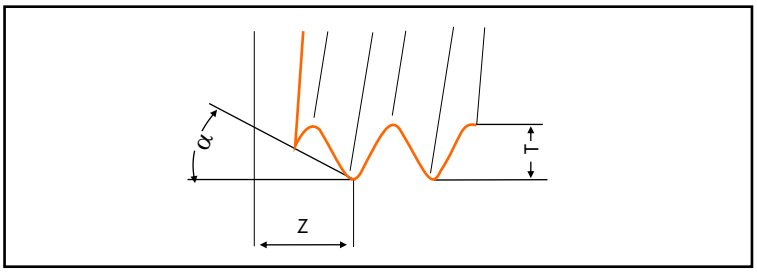


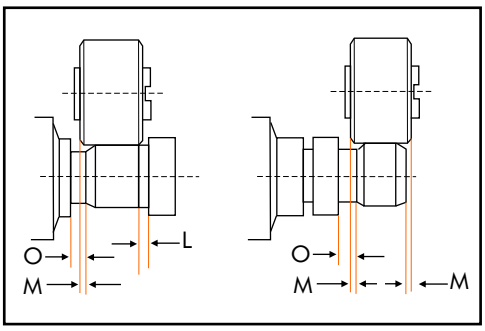
The thread rolls are marked with:

- The company symbol
- Type of thread
- Thread pitch / threads per inch,
- thread diameter,
- setting value for micrometer setting gauge and
- synchronal marking C and D or A and B, as well as C and D in reversible rolls (R)

3.5 Position of the thread roll in relation to the workpiece

The thread rolls are beveled at an angle a. The angle a = 30° should be used in preference. Angle a = 45° or 60° is used when the last complete thread of the workpiece has to lie close up to a collar.





Between the thread roll and the collar of the workpiece, there should be a safety clearance. The smallest possible distance of the usable thread section from the collar is marked by dimension »L«. The section of the thread roll with a full profile height must reliably cover the produced thread, also taking into account a safety margin. This condition is fulfilled when the measurement »M« is adhered to or exceeded. These two requirements bring about the need for the minimum width »O« for cut-off.

The measurements L, M and O depend on the profile depth T and can be calculated as follows:

	α =30°	α =45°	α =60°
L	2.65 x T	1.88 x T	1.42 x T
M	2.24 x T	1.46 x T	1.02 x T
O	3.05 x T	2.28 x T	1.84 x T
Z	1.84 x T	1.06 x T	0.62 x T

The thread depth T can be derived from the thread pitch P using the table below.

Type of thread	Standard	Thread pitch • factor = thread depth
Metric ISO	DIN	P • 0.62 = T
Whitworth	BS	P • 0.65 = T
Whitworth pipe	BS	P • 0.62 = T
Acme	DIN	P • 0.50 + 0.25 = T
Valve	DIN	P • 0.7 = T
Armoured pipe	DIN	P • 0.5 = T
UN	ASA	P • 0.62 = T

4.0 Machine Tool

Attachment sizes:
▶ see page 5.

The space requirement of the various attachment sizes is indicated on page 5. When moved forward into the extended position, the attachment should not be allowed to collide with adjacent machine components, tools or workpieces. In the reversed position, there should be no obstruction to work with adjacent tools. In the case of multi-spindle lathes, the attachment must move back far enough to permit indexing of the turret.

Tool carrier:
▶ Please note pages 22 and 23!

The tool carrier drive system must be designed to cover the required thread roll advancement both in fast feed and at work speed.

After achieving the foremost position, the thread rolling attachment should move back immediately in rapid traverse (pages 22 and 23). Cross slides with cam control or hydraulic drive systems comply with this requirement.

In certain cases, modification may be necessary to permit a certain attachment size to be used. The modifying process can affect the thread rolling attachment, the machine tool, the adjacent tools and tool holders.

Occasionally, it is necessary to increase the stroke of the cross slide. **Rolling in of chips and scale can damage both the workpiece and the thread rolls.**
The attachment should therefore be arranged so that no chips from adjacent machining stations are able to gain access to the thread rolling process.
Another solution is to mount a protective cover. **In multiple-spindle lathes, it is generally advisable to fit the thread rolling attachment in the uppermost spindle position.**

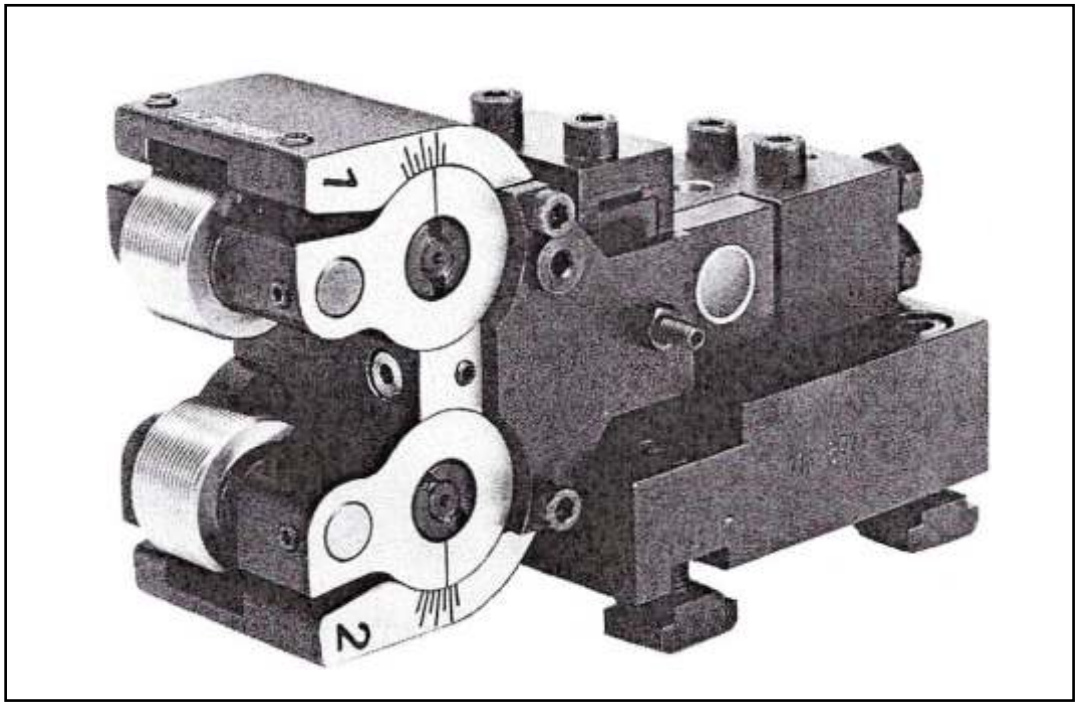
When using thread rolling attachments on CNC machines with several tool carriers, ensure that thread rolling attachments are not used where they can be affected by chips falling from adjacent tools.

The table on pages A-S and A-NC offers a guideline regarding application possibilities. In addition, there are many other machine types on which WAGNER® thread rolling attachments can be and have been used. Please enquire with us.

4.1 Adapters

* Adapters for NC machines with cross slides are included in the A-NC lists

To fix the thread rolling attachments on the different machine tools, in some cases widely differing types of adapter can be necessary.
All adapters have been ideally adapted to the relevant machines and attachments. For reasons of economy, wherever possible a modular system of adapter construction is used.
The adapter lists A-S to A-NC, which are continuously being updated, contain a wide ranging variety of adapters. In addition, it is possible to assemble adapters from modular components to fit machines which are not included on the list of machine types.
When thread rolling tangentially, it is always necessary for the thread rolls to reach the centre line of the workpiece. However, the thread rolling attachment can also be made longer or shorter by setting different thread diameters (swivel movement of the pairs of arms). For this reason, the tool carrier must be fitted with an adjustment facility (manual adjustment on cam-controlled machines/ x-axis correction in CNC machines).
As mentioned above, the adapter lists attached in the annex are divided according to A-S* and A-NC*. This is intended to make it easier for you to find the right adapter for the various tool machine types.
The adapter lists also offer information on any necessary modification of existing tool carriers, restrictions regarding adjacent cross slides or infringement of adjacent clamping stations by the thread rolling attachment.



A-NC version with shaft support as per DIN 69 880 A-S version with slide plate

4.2 Determining the power

To determine the necessary driving power, the feed force and the selected rolling speed are required. The following then applies:

$$\text{Drive power} = \frac{\text{Feed force} \cdot \text{rolling speed}}{60{,}000}$$

Example: M20 x 1,5 x 27; V = 60 m/min.

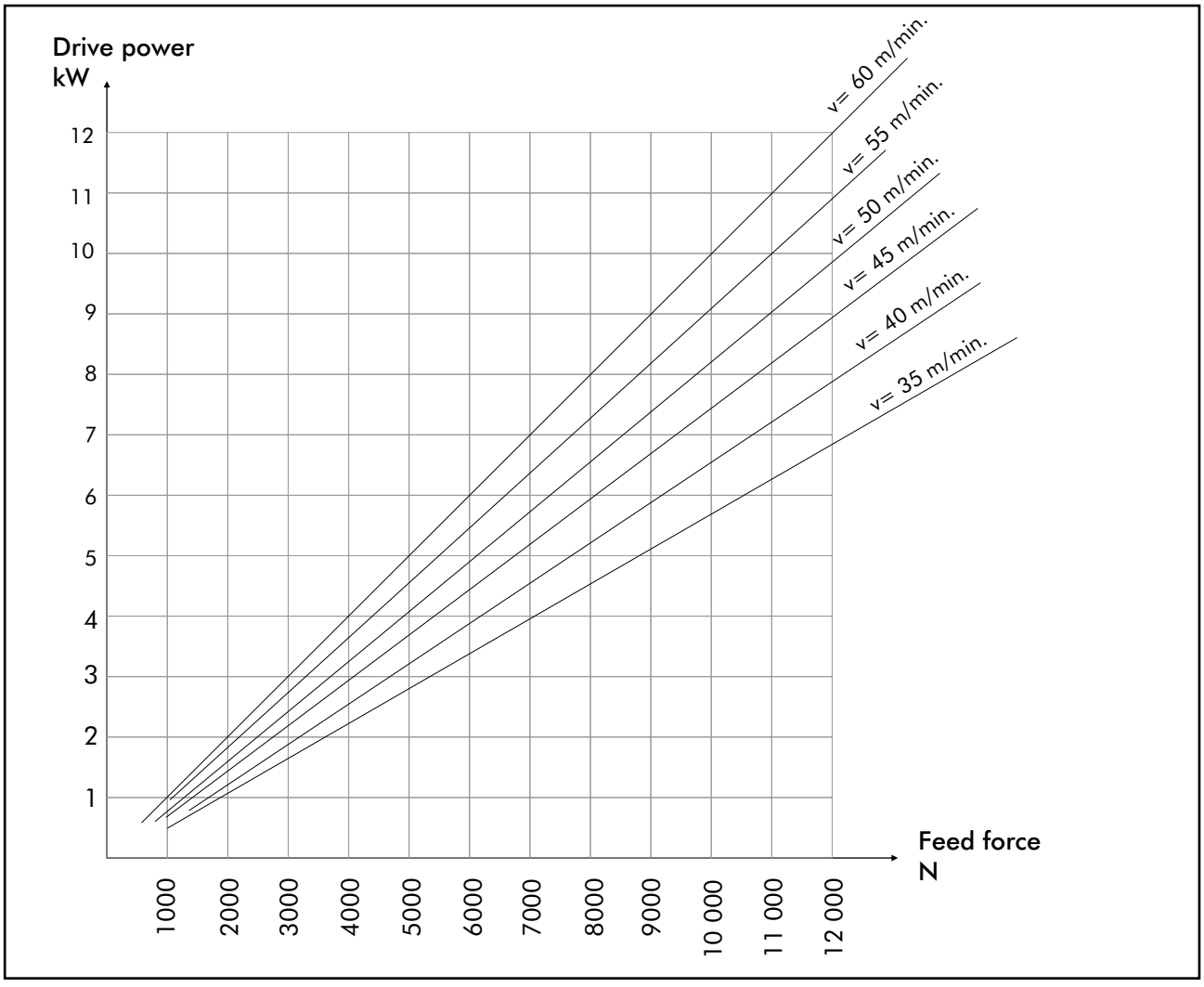
$$Na = \frac{5{,}265 \cdot 60}{60{,}000} = 5.3 \text{ kW}$$

4.3 Rolling speed

Experience has shown that the best results are achieved at rolling speeds of between 50 and 80 m/min. Rolling should never take place at speeds below 30 m/min, as otherwise the rolled material is not given a chance to flow. Higher rolling speeds require very high-grade coolants which ensure minimum friction of the roll bearings etc.

Roll bearings:
▶ see page 11

▶ **Caution: For CNC lathes, a certain speed – but not V = constant must be programmed!**



4.4 Duty stroke

The duty stroke S is the path covered from first contact of the thread rolls with the workpiece, until the centre line of the workpiece.

Q = Pre-machining diameter of the workpiece
(usually corresponds to the medium effective diameter d_2)
d_3 = Minor diameter at the workpiece
R = Major diameter of the thread roll
S = Duty stroke
U = Depth of penetration of the thread roll = $\frac{Q - d_3}{2}$

f = Distance between thread roll centres
= $Q + R - 2 \cdot U$

Calculation of the duty stroke S:

If not specified in tables G1 to G ..., it is possible to calculate the duty stroke »S« as follows:

$$S = \sqrt{Q \cdot U \cdot (N+1)}$$

N* = Number of thread starts on the roll
R* = Roll diameter (* count/ measure on delivered rolls)

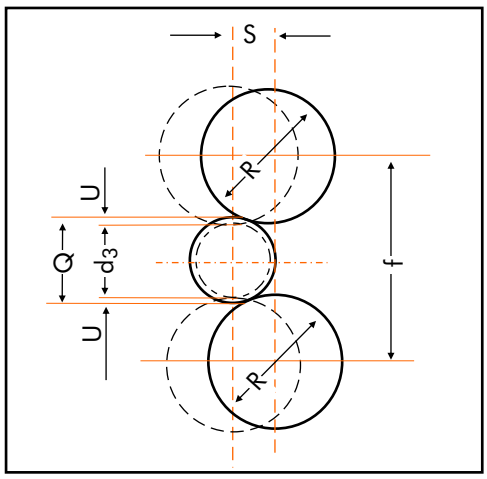
Example:
Thread M 10
Rolling attachment B 8-W
Roll diameter R = 25.8; Rolls N = 3
Turning diameter Q = 8.94 mm
Core diameter d_3 = 8.16 mm

Depth of penetration U:

$$U = \frac{Q - d_3}{2} = \frac{8.94 \cdot 8.16}{2} = 0.45 \text{ mm}$$

$$S = \sqrt{8.94 \cdot 0.45 \cdot (3+1)} = 4 \text{ mm}$$

Revolutions of the workpiece



During the entire duty stroke of the thread roll S, the thread profiles of both rolls must assume a precisely defined position in relation to each other.
For this reason, the thread rolls have been provided each with a synchronization or match marking »C« and »D« (in reversible rolls »A« and »B« as well as »C« and »D«) by the manufacturer (see page 13). If the rolls have been correctly mounted and set in relation to each other (see page 29), both tools will be working in the same thread groove at the beginning of the deformation process.
As the rolling cycle continues, the rolls turn radially in relation to each other. This is visible at the compensator block of the synchronous gear.
The stroke of this compensator block is limited. For this reason, the thread rolls must not under any circumstances be permitted to dwell at the centre line of the workpiece.

Suggested workpiece revolutions (W) for duty stroke (S)

Thread pitch (mm)	B 8-W			B 10-W			B 13-W		
	Brass/ aluminium alloys	Steel up to 700 N/ mm²	Steel up to 900 N/ mm² stainless steel	Brass/ aluminium alloys	Steel up to 700 N/ mm²	Steel up to 900 N/ mm² stainless steel	Brass/ aluminium alloys	Steel up to 700 N/ mm²	Steel up to 900 N/ mm² stainless steel
0.4 - 0.5	* 8 - 10	* 9 - 11	* 11 - 12						
0.6 - 0.8	* 9 - 12	* 11 - 13	* 13 - 15	* 10 - 12	* 11 - 13	* 14 - 16	* 10 - 12	* 12 - 14	15 - 17
1	* 11 - 13	12 - 14	14 - 16	10 - 12	12 - 14	15 - 17	11 - 13	14 - 16	17 - 19
1.25	12 - 14	13 - 15	16 - 18	12 - 14	14 - 16	18 - 20	13 - 15	16 - 18	19 - 21
1.5	12 - 14	13 - 15	16 - 18	12 - 14	15 - 17	18 - 20	13 - 15	16 - 18	20 - 22
1.75	13 - 15	14 - 16	17 - 19	13 - 15	16 - 18	20 - 22	15 - 17	18 - 20	22 - 24
2	14 - 16	15 - 17	18 - 20	14 - 16	17 - 19	21 - 23	15 - 18	18 - 21	22 - 25
2.5							18 - 21	22 - 25	26 - 29

Thread pitch (mm)	B 15-W			B 18-W			B 36		
	Brass/ aluminium alloys	Steel up to 700 N/ mm²	Steel up to 900 N/ mm² stainless steel	Brass/ aluminium alloys	Steel up to 700 N/ mm²	Steel up to 900 N/ mm² stainless steel	Brass/ aluminium alloys	Steel up to 700 N/ mm²	Steel up to 900 N/ mm² stainless steel
0.8	12 - 14	14 - 16	18 - 20	12 - 14	14 - 16	17 - 19	13 - 15	16 - 18	20 - 23
1	13 - 15	16 - 18	19 - 21	13 - 15	16 - 18	19 - 21	14 - 16	17 - 19	22 - 25
1.25	15 - 17	18 - 20	21 - 24	* 15 - 17	18 - 20	21 - 24	15 - 18	19 - 22	24 - 27
1.5	16 - 18	19 - 22	23 - 26	16 - 18	18 - 21	22 - 25	16 - 19	20 - 23	25 - 28
1.75	17 - 20	21 - 24	24 - 28	16 - 19	20 - 23	23 - 27	18 - 21	22 - 25	26 - 30
2	18 - 22	22 - 26	25 - 30	17 - 20	21 - 24	24 - 28	19 - 22	23 - 26	27 - 31
2.5	21 - 25	25 - 29	30 - 35	20 - 23	24 - 27	27 - 31	21 - 25	25 - 29	30 - 35
3				21 - 24	25 - 28	28 - 32	22 - 26	26 - 30	31 - 36

* For thread diameters below 6 mm, 14 to 20 workpiece revolutions are recommended, if the workpiece is not supported by a lathe centre or supporting rolls.

5.0 Feed

The duty stroke S explained on page 18 is the path which the thread rolling attachment must cover from the beginning of the rolling cycle to the centre line of the workpiece. For this, the »Suggested number of workpiece revolutions W« listed on page 19 are required. The following calculations can be derived from this:

5.1 Formulas for calculating the feed rate

Machines with mechanical advance control

$$V_U = \frac{S}{W}$$

V_U = Tool carrier feed per workpiece revolution
S = Duty stroke
W = Number of required workpiece revolutions

Machines with hydraulic feed control

$$V_m = \frac{S \cdot n}{W}$$

V_m = Tool carrier feed [mm/ min]
S = Duty stroke
n = Revolutions of the working spindle [min^{-1}]
W = Number of required workpiece revolutions

Feed stroke

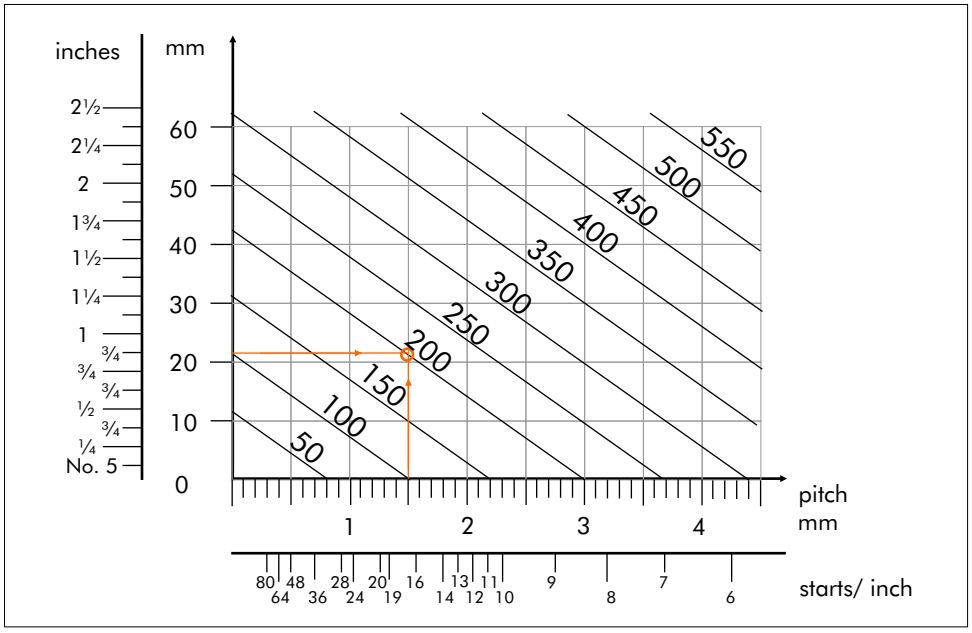
As all thread rolling attachments are mounted in self-centering adapters, the entire system should be rotating at commencement of the deforming process and a number of machine tools demonstrate a certain delay when changing from approach fast feed to slow working speed, a roll pickup allowance of 25% for thread roll advancement should be included.

5.2 Determining feed forces

Feed force = length of thread · A · B · C
Feed force in N
Length of thread and thread diameter in mm
A = Tangential force in N/mm length of thread;
B = Material constants;
C = Attachment constant.

1. Detremining A

A can be found in the above graph by starting at the thread pitch and the thread diameter. Their point of intersection is the factor A in Newton.



Graph: Determining A

2. Determining B

B = 0.7 for materials with tensile strength of up to 600 N/mm²
B =1.0 for unalloyed and low-alloyed steel up to 700 N/mm²
B =1.4 for steel up to 900 N/mm² and stainless steel

3. Determining C

C = 1.2 for B 8, B 10
C = 1.0 for B 13, B 15, B 18, B 36, B 44

Example

Thread M 20 x 1.5
Length of thread: 27 mm
Material strength: 700 N/ mm²
Attachment: B 18
Feed force = Length of thread · A · B · C
= 27 · 195 · 1,0 · 1,0
= 5265 N

Advancement control on cam-controlled machines

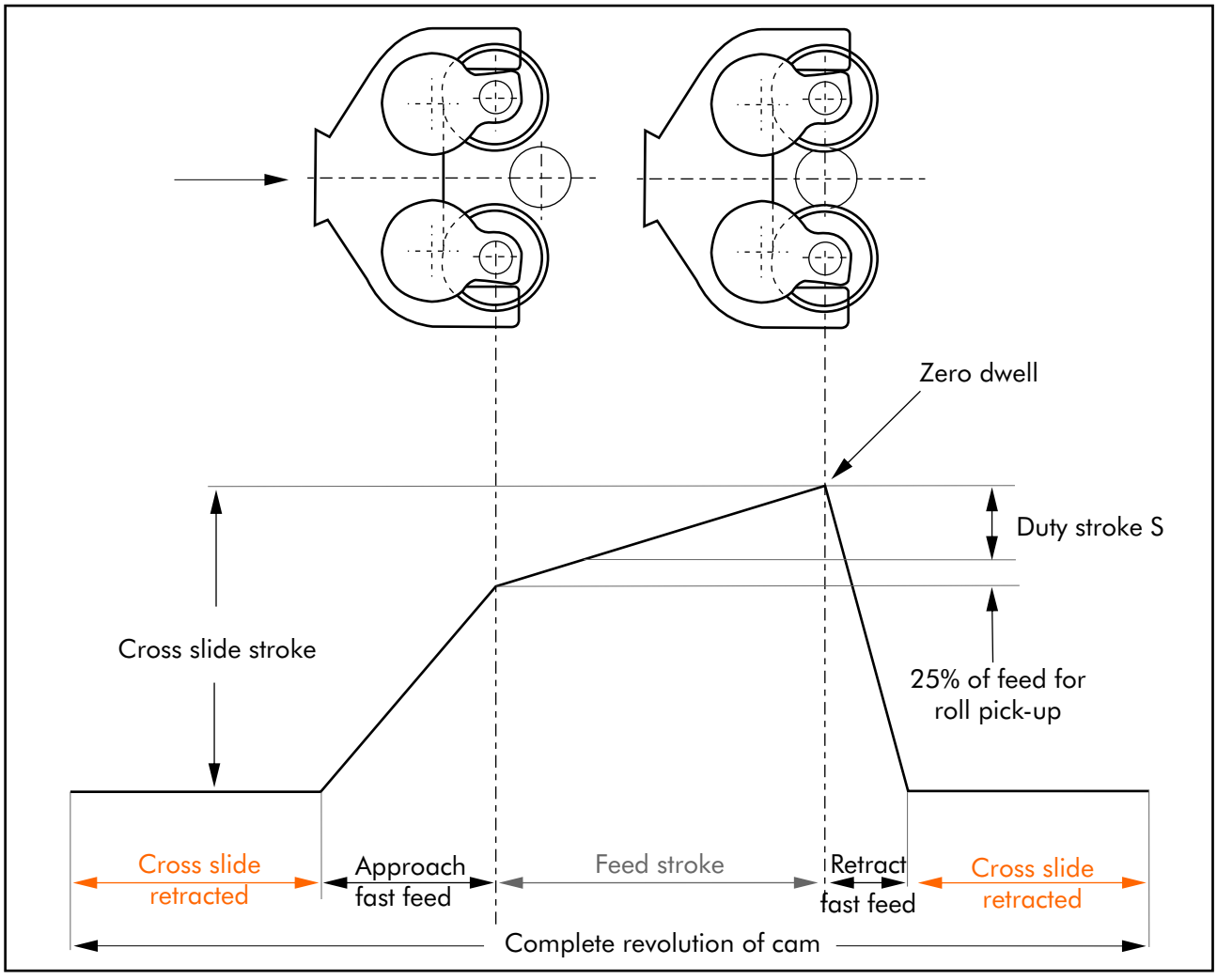
When designing thread rolling cams, a maximum slide stroke should be aimed at in order to avoid the possibility of chips soiling the attachment. The rolling cam should not contain a concentric cam section at its highest point.

The roll slide must be restricted without fail in the front most working position by a fixed stop.

For machines with fast approach speed switchover, the start of work retraction should coincide with the start of fast feed. When using a thread rolling attachment, positive retraction of the rolling slide is unavoidable.

When buying control cams from other sources, as well as the above mentioned factors the cam producer also requires the following information:

- Machine manufacturer, type of machine and machine number
- Spindle position/ cross slide number
- Planned spindle speed
- Planned time per piece
- Required thread duty stroke S+25%
- Slide feed per spindle revolution



Feed control on CNC machines

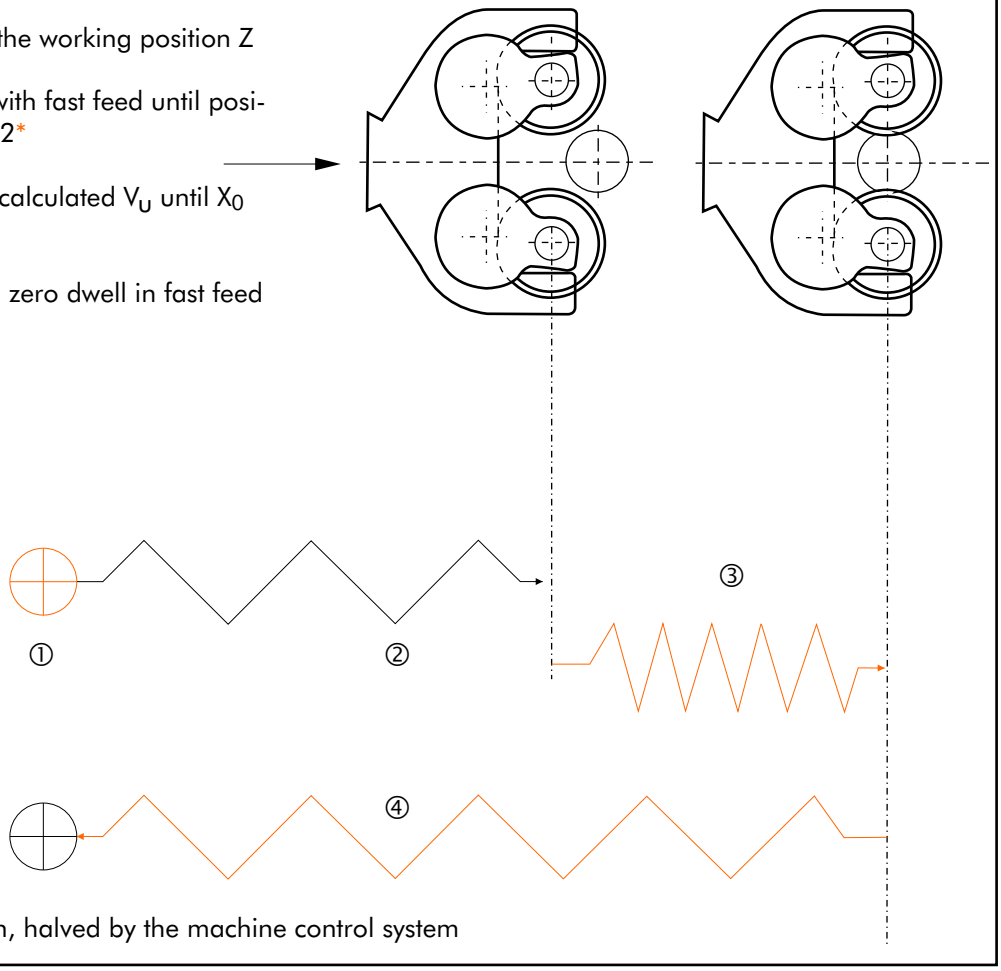
The movement sequence of the tool carrier should be effected as shown in the sketch below:

① Move attachment to the working position Z

② Approach on x-axis with fast feed until position X_0 + (S+25%) · 2*

③ Travel on x-axis with calculated V_U until X_0 (centre of spindle).

④ Retract on x-axis with zero dwell in fast feed to come full circle.



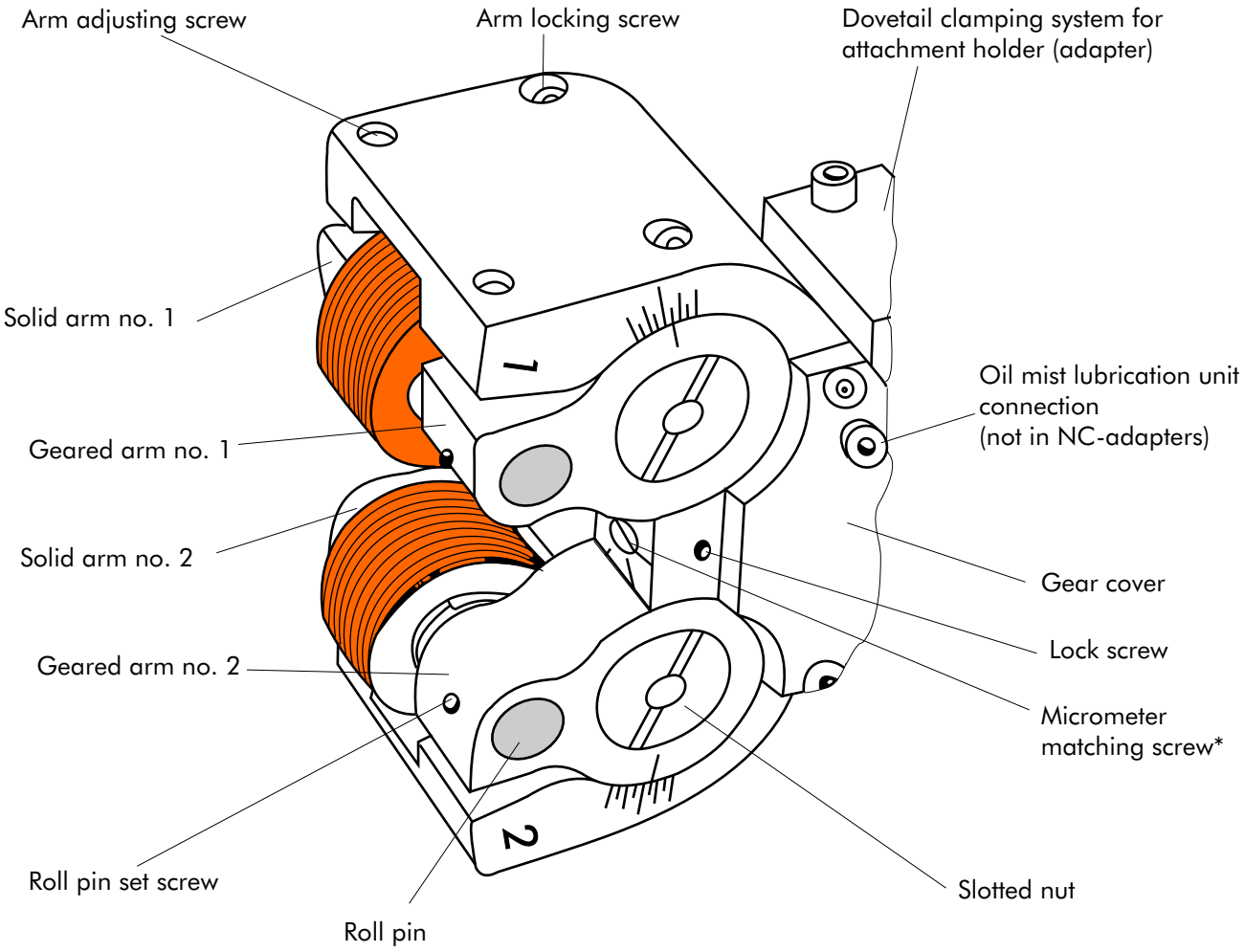
* Diameter specification, halved by the machine control system

Feed control on machines with hydraulic feed systems

Please proceed using exactlx the same sequence pattern as described above. The switchover point between approach fast feed and feed stroke slow feed is S+25% before the centre line of the workpiece.
Using the formula below, the necessary rolling feed V_U can also be calculated in seconds for a certain – arbitrary – measuring length x.

$$t_x = \frac{x \cdot 60 \cdot W}{S \cdot n}$$

tx = Time in seconds for measurement length x
x = Measurement length in mm
W = Required work revolutions
S = Duty stroke
n = Spindle revolutions per minute



* **Exception:** with B 15, the micrometer matching screw is positioned on the dovetail side.

6.1 Mounting the thread rolls

Before inserting or changing the thread rolls, put the synchronal gear out of operation to simplify the subsequent adjustment of the attachment:

- Remove the gear cover, unscrew the locking screws behind the compression screws on the compensator block and take out the compensator screws.
- Then release the micrometer matching screw lock and unscrew the micrometer screw completely. It is now possible to remove the compensator block together with the mounted gear wheel from the gear chamber.

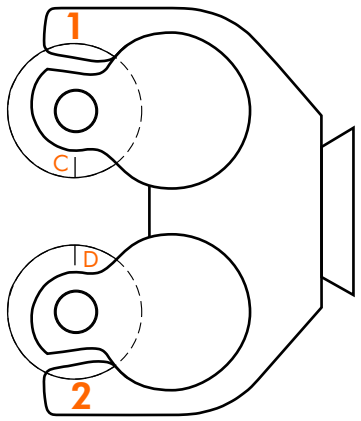
Then release the roll pin set screws, and push the roll pin out in the direction of the gear far enough to permit the rolls to be inserted. The thread rolls are marked with »C« and »D«, and reversible rolls with »A« and »B« on the second side. The rolls should only be used in sets.

Insert:

Roll »C« in attachment side »1«,

Roll »D« in attachment side »2«
or

Roll »A« in side »1«
and »B« in side »2«

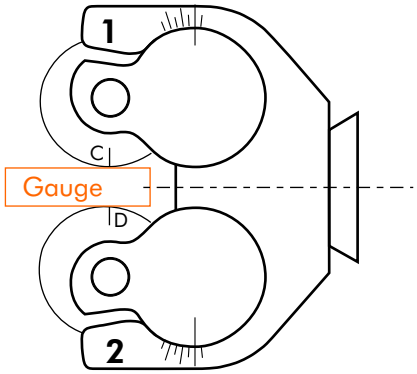


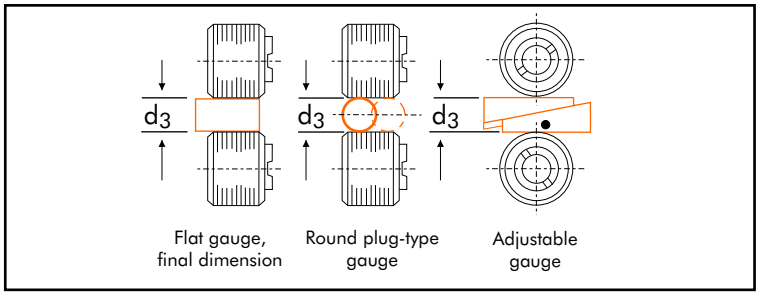
The marking should always be facing the gear side.

When using thread rolls with recessed drive slot – type D – the solid arms must additionally be pulled out by the depth of the drive slot. This is made possible by loosening the nuts and releasing the arm locking screw. After mounting the thread rolls, tighten the roll pin set screws and position the nuts on the arms in such a way that the arms are able to move without backlash.

6.2 Adjusting the rolling attachment arms

The thread diameter is determined by adjustment of the thread attachment arms. For this reason, a gauge must be used which corresponds to the smallest minor diameter d_3 of the thread you wish to produce. For higher-strength materials > 500 N/mm², it is even advisable to select the gauge some 0.05 - 0-10 mm smaller, depending on the size and length of the thread, so accounting for spring back of the attachment.





The gauge is held between the thread rolls and the arms are adjusted in such a way that the same setting is indicated by the scales on the head body. This ensures symmetrical progression of force through the attachment.

Adjust the arms using the arm adjusting and locking screws, and tighten the nuts lightly.

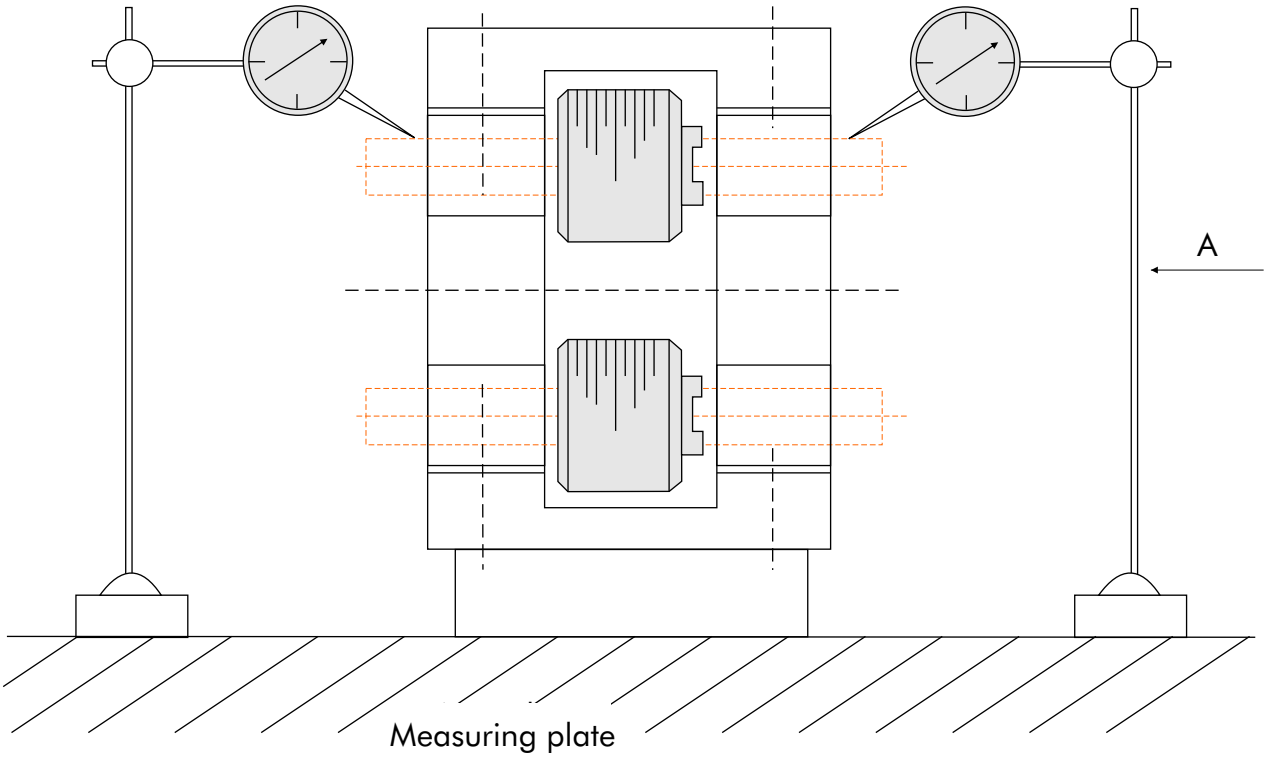
Caution: The minor diameter must be adjusted precisely, i.e. never greater to ascertain the pre-machining diameter, as otherwise the progression of the thread is not correct and damage can occur.

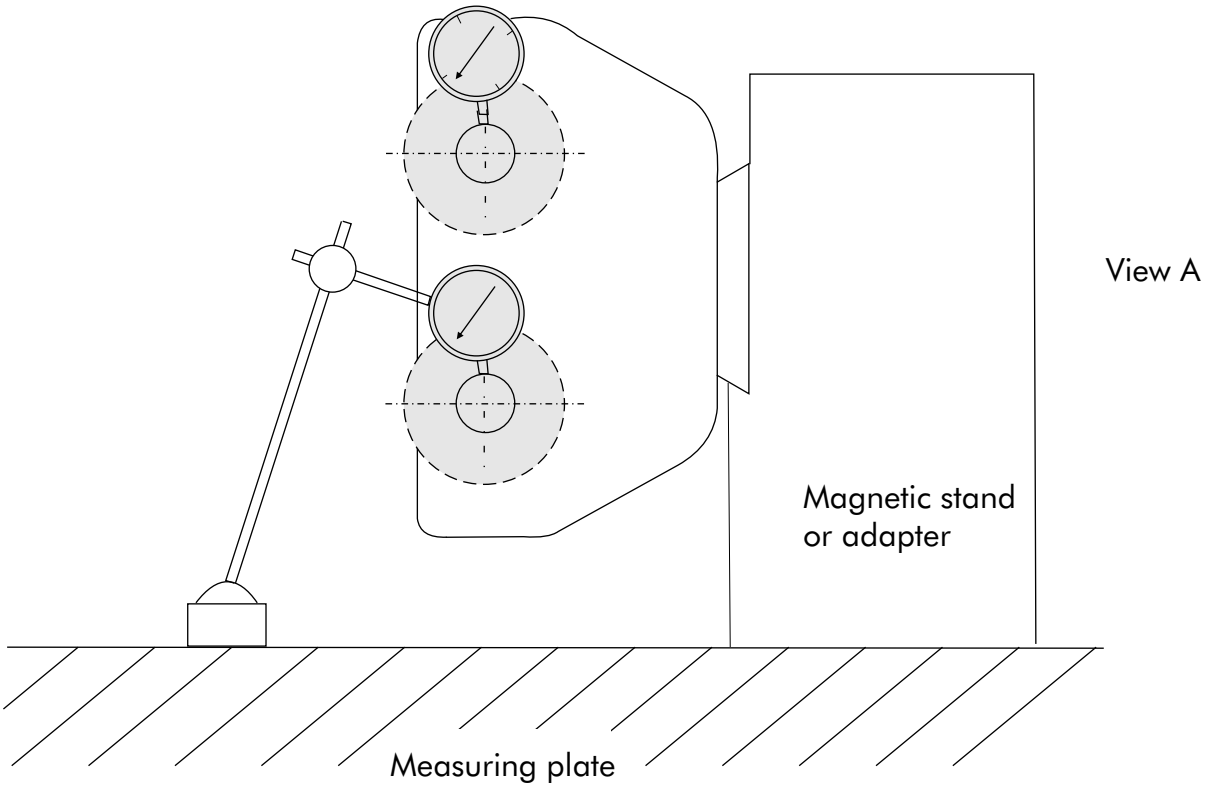
It is important during setting work for the roll pins to be parallel in relation to each other, and later in relation to the work axis.

It is possible to check this roughly by releasing the roll pin set screws again, after which it should be possible to easily displace them.

Precise testing of this condition can be carried out using the device described on page 24. During measurement, the roll pin is pushed from one side to the other to permit it to be reached with the measurement probe. At the same time, attention must be paid to the roll gap, and finally the nuts in the arms tightened, **always starting with the nuts on the solid arms.**

Parallel adjustment of the roll pins
max. deviation 0.02 mm





6.3 Adjusting the thread rolls

For preparation:

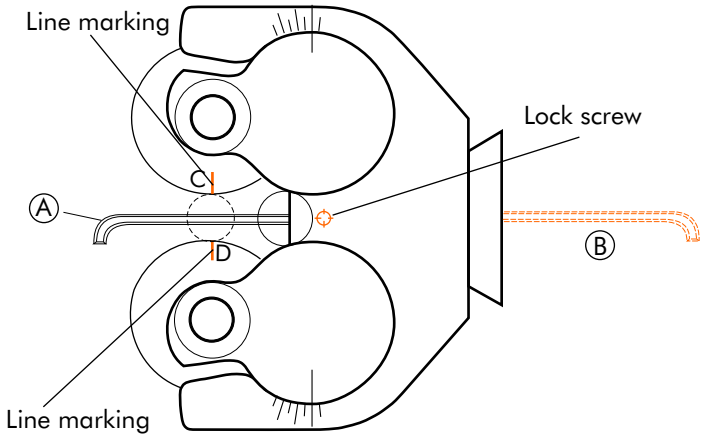
▶ see page 21

UIn order to roll a perfect thread, it is essential for the profiles of the two thread rolls to be in absolute alignment in relation to each other.

To help the operator achieve this setting, the rolls are marked with »C« and »D« on the drive slot side.
In reversible rolls, the second side is marked »A« and »B«.

However, all markings are only correctly in place when facing the gear side.

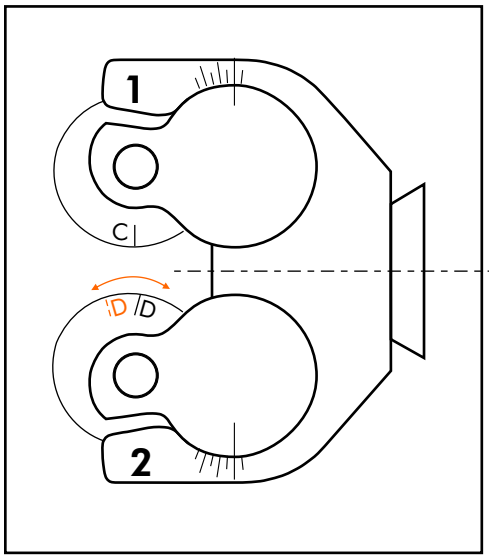
To carry out adjustment, the two markings are positioned opposite each other, as shown in the sketch below.



Ⓐ
Application of hex. wrench into micrometer matching screw in B 8-W, B 10-W, B 13-W, B 18-W, B 36, B 44

Ⓑ
Application of hex. wrench into micrometer matching screw B 15-W

In this position, hold the rolls firmly and place the gear wheel with compensator block irn the next possible position nearest the rolls in the gear (**exception**: B 15-W: Here, the gear wheel with compensator block is inserted into the next possible position in the dovetail).



Then screw in the micrometer matching screw and mount the two compensator springs with locking screws.

Using the micrometer matching screw, set the correct position of the two line markings in relation to each other, and secure the micrometer screw by tightening the lock screw.

The correct setting has been attained when the »C« marking is pointing towards the centre of the opposite roll and the »D« marking, due to gear backlash, can be moved by the same amount to each side of the »C« marking. The same applies analogously to the »A-B« marking.

Correcting the setting:

▶ see point 9.1, page 38

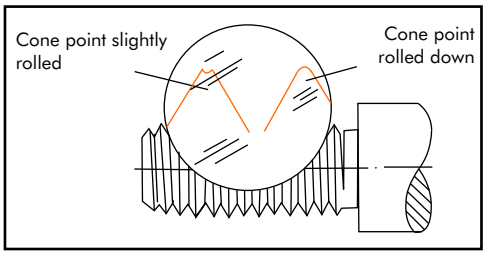
It is possible that this setting may have to be corrected slightly, depending on the sense of direction of the machine spindle or the mounting position of the thread rolling attachment.

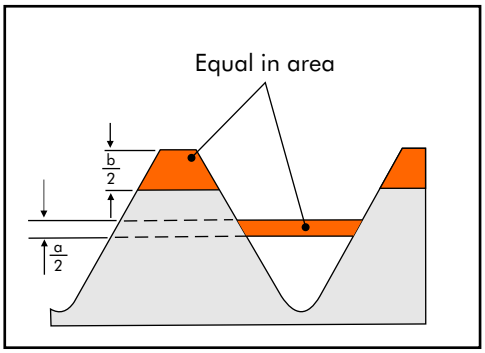
After completion of setting work, it is essential to check whether the rolls and the gear are still easy running. The function and easy running properties of the compensator block must also be checked. To do this, hold on to one of the rolls and turn the other one towards the attachment head. When doing so, the compensator block must compress the integrated compensator screws, and return to its starting position after the roll is released.

To roll extremely fine threads in easily formable materials such as aluminum or brass, it may be necessary to shorten the original compensator screws no. 6 somewhat or to use less aggressive springs. In this type of application case, it is also essential to ensure during function testing that the compensator block returns to its starting position after releasing the, rolls.

The gear cover is then mounted again.

7.1 Determining the pre-machining diameter





Graph: Profile suppression when thread rolling: $^{a}/_{2}$ at the starting-Ø results in $^{b}/_{2}$ at the thread Ø.

Work preparation is carried out in accordance with the type of material flow which takes place by cold formation during the thread rolling process. The volume displaced from the crests of the thread profile on the rolls must be equal to the volume flowing into the thread crests on the workpiece. For this reason, the pre-machining diameter required for thread rolling corresponds approximately to the effective diameter of the thread, and the flow properties of the material also play an important role.
The precise pre-machining diameter can only be ascertained by testing. It should be selected to ensure the thread cannot be overloaded with the correct effective diameter, but preferably with an unfinished crest.

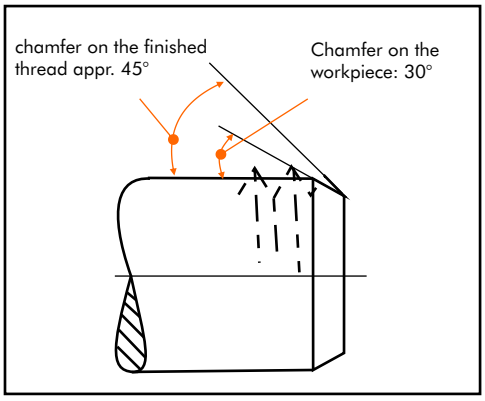
The pre-machining diameter ascertained 'in this way is the maximum dimension, and the permissible tolerance towards minus corresponds to appr. 1/6 of the major diameter tolerance of the thread. If this tolerance is adhered to, the major diameter will be formed within the permissible tolerance.
Alterations of the machining or initial diameter have between 3 and 5 times as great an effect on the major diameter of the rolled thread. An alteration of 0.02 mm in the initial diameter can therefore cause a difference of 0.1 mm on the major diameter of the thread.

When first determining the pre-machining diameter, it is advisable to select a diameter equal to the mean effective diameter. This offers a basis from which the thread can be rolled. For this, the setting of the thread rolling attachment arms (see 6.2 on page 27) must be selected so that the correct effective diameter is achieved.

Depending on the major diameter you achieve, the pre-machining diameter can be corrected accordingly.

▶ **On no account should you overload the thread by using an excessive initial diameter, as this will place too high a strain on the rolls and lead to roll breakage.**

7.2 Chamfering of the workpieces



Graph: Phase for strting the thread rolls

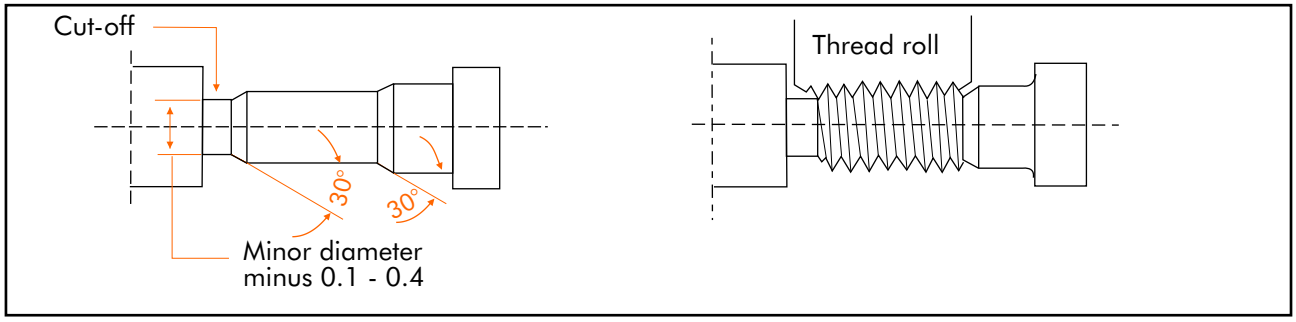
At the start of the thread, the pre-machined workpiece has to be equipped with a phase of 30° (flat in relation to the tool axis) and also, where applicable, at the relief groove. Depending on the pitch you require, the chamfer should start between 0.1 and 0.4 mm under the minor diameter of the thread. After rolling, a 30°chamfer will produce a thread start-up and run-out of approximately 45°.

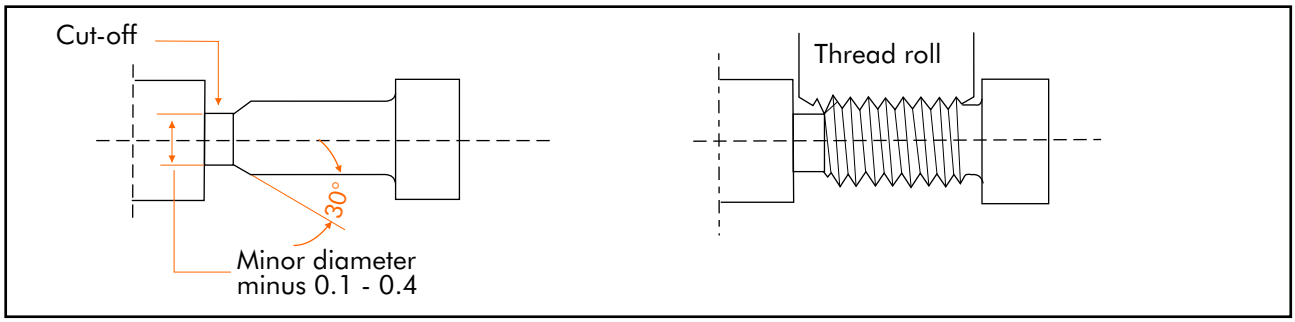
Caution: A steeper chamfer will considerably reduce roll life!
In addition, excessive handling is detrimental to the thread startup.

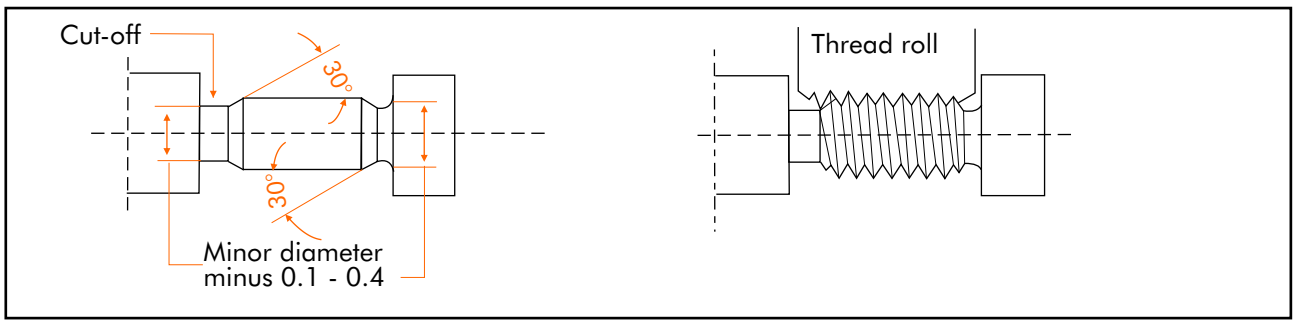
Excessively small chamfers lead to bulging on the face side when the thread is rolled at the open end of the workpiece.

7.3 Examples of workpiece design

Pre-machined workpiece **Finished workpiece**



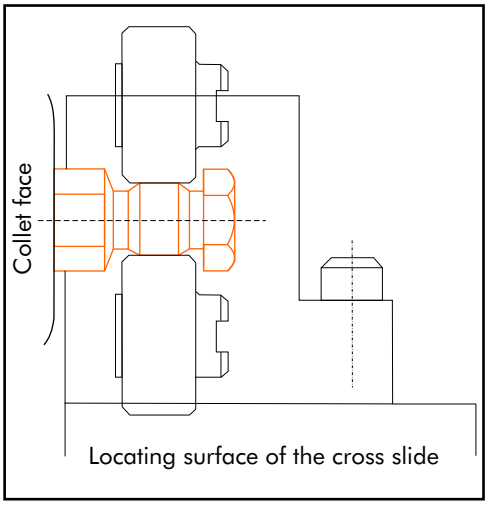




8.0 Mounting The Rolling Attachment On The Machine

Before mounting the attachmet on the machine, the workpiece with the calculated pre-machining diameter Q and with the required chamfer must be positioned correctly in the working spindle. **Please check the pre-machining diameter once again.**

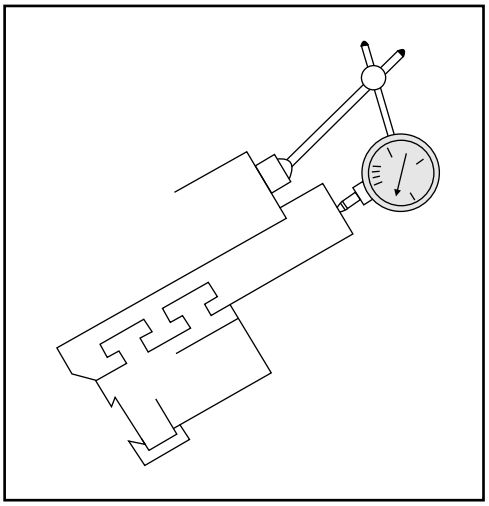
8.1 Cam-controlled machines with cross slides



Before being fixed on-the slide, the adapter must be aligned in such a way that the rolls assume the correct position in relation to the workpiece. Now, the entire system can be used without any obstructions.

Please pay attention that the correct distance between the workpiece collar, the collet face and any adjacent tools.
A precise correction can be carried out using the stop screw mounted on the gear cover.

This gear cover with stop spindle is supplied with the A-S type adapter, and must be exchanged (on demand) for existing parts (see also picture on page 50).



Sketch: How a gauge can be used for simple and reliable determination of the highest point of the actuating cam.

Once the adapter has been firmly positioned, move the cross slide to the rear position using the manual adjustment device. Set the micrometer setting gauge to the reading marked on the thread rolls. This reading is also allocated in the form of an E value to the relevant threads and the attachment sizes in the range tables G1 to G....The adjusted gauge is then locked into place in the mounted adapter.

Now position the machine cross slide in its foremost position, i.e. so that the cam roll has reached the highest point of its actuating cam.

Using a similar device, the roll advance per spindle revolution can also be checked. To do this, couple the spindle and feed drive. Turn the spindle onwards manually or in inching operation for a few revolutions. Dividing the feed path by the number of spindle revolutions results in the feed in mm per revolution. Then move the cross slide forward using the manual adjustment device until the tip of the micrometer gauge touches the workpiece blank which has been formed or shaved to the correct rolling diameter Q.

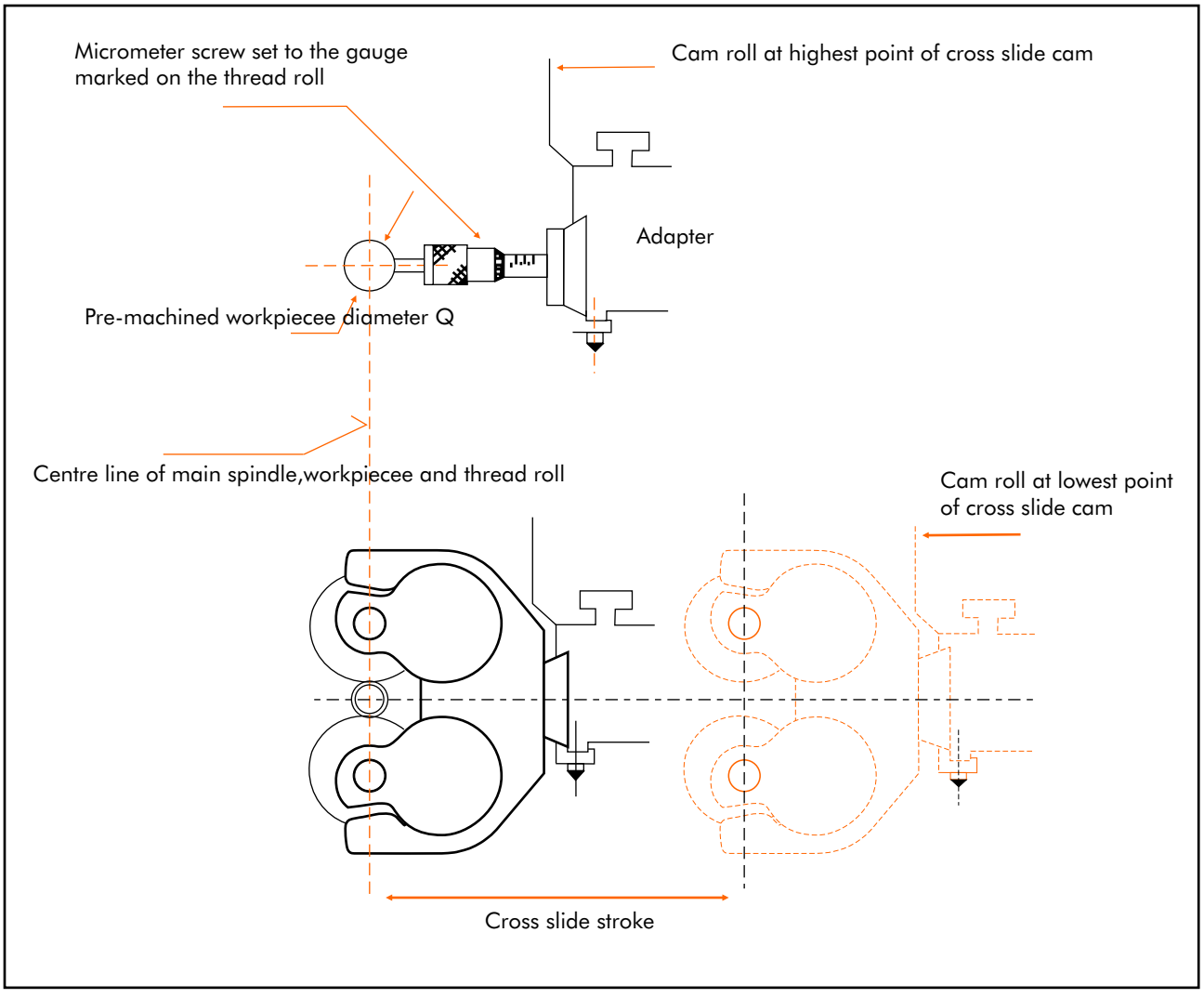
Cam-controlled machines with cross slides

Then restrict the cross slide in this position using the fixed stop. It is not permissible to ever cross this point with the mounted rolling attachments.

When the ready adjusted thread rolling attachment is later mounted in place of the micrometer setting gauge, the centre axes of the thread rolls and the blank are positioned precisely one above the other.

▶ **Caution: Never run over the center of the workpiece with the thread rolling attachment! This will lead to broken die!**

8.2 Adjusting the attachment to »center of the workpiece«


Micrometer screw set to the gauge marked on the thread roll
Cam roll at highest point of cross slide cam
Adapter
Pre-machined workpiecee diameter Q
Centre line of main spindle,workpiecee and thread roll
Cam roll at lowest point of cross slide cam
Cross slide stroke

8.3 CNC machines

The adapters are fitted with shaft supports according to DIN 69880 or with machine-specific screw-on brackets or plates, and are retained directly in the tool carrier.

There is a fixed stop pin on the adapter against which the thread rolling attachment makes contact during clamping. Lateral alignment of the attachment relative to the blank and any existing interfering edges must be effected using the Z-axis of the machine control.

The micrometer setting. gauge must be set to the measurement engraved in the rolls. Clamp the correctly adjusted gauge into the adapter.
Then move the tool carrier with the adapter and micrometer

in position far enough forward for the tip of the gauge to touch the premachined diameter Q of the blank. The tool carrier position ascertained in this way is now taken as X_0. This means that the axes of the thread rolls and the blank are on a line with each other.

Never run over this tool carrier position!

The dimension C specified in the calculation sheet only serves as a guideline value for programming purposes and must be checked as described above.

In machines with integrated tool gauging, the tip of the micrometer can be gauged.
Caution: Remember to add Q/2.

Using this process, it is essential to check your result, i.e. always move the tip of the micrometer gauge to the pre-machined blank diameter Q once again.

8.4 Hydraulically controlled machines with cross slides

Setting is carried out using the same procedure as that outlined on page 34 for cam-controlled machines.

Experience has shown that the most accurate roll feed is achieved if the time tx (see page 21, second half) is ascertained for as long a measurement path x as possible.

Then draw the measurement path x on the slide locating surface and regulate the slide speed so that the marked path is crossed by the slide in the time tx. Then set approach fast feed in such a way that it switches off at S + 25% pickup allowance before the centre line of the work. The duty stroke S +25% is traversed with roll feed (corresponds to Vu), and after reaching the front-most slide position (rolls positioned precisely at the centre line of the workpiece) immediate switchover to retract fast feed must be effected **with zero dwell**.

A fixed stop to limit the front slide position is essential.

8.5 Retract movement

The setting work carried out so far affected tool carrier forward movement. Tool carrier retraction should also be checked again according to the following points.

- **For cam-controlled machines**: Fast feed retraction of the rolling slide with zero dwell in the foremost position. A restoring cam, return motion device or forcing plug are absolutely essential to ensure reliable retraction of the tool which has been tensioned by the rolling process.

  If a **fast feed switchover facility** is available, the start of the fast feed and the start of the rolling slide retract movement should coincide.

- **For CNC machines**, the attachment must be retracted in fast feed with zero dwell along the X-axis until it is completely clear of the workpiece.

- **For hydraulically controlled machines**, after reaching the foremost slide position switchover to retract fast feed is effected with zero dwell.

Once these processes have been completed, remove the micrometer setting gauge from the adapter and ensure that the machine is working correctly by carrying out a number of automatic working cycles.

8.6 Centering the rolling attachment in the machine

Clamp the ready assembled thread rolling attachment into the adapter, carry out lateral adjustment and traverse forward until the rolls are almost touching the workpiece.

In case of slide adapters, the adjusting spindle [63] located on the adapter (see page 55) is used to set the thread rolling attachment in such a way that it is positioned a maximum of 1 mm below the centre line of the workpiece, depending on the thread diameter. Then lock the adjusting spindle with the lock nut. Adjust the adapter components spring bolt [60] and compensator spring [61] using locking screw [62] in such a way that the attachment centers itself correctly. Then also secure locking screw [62].

If the thread rolling attachment is held in position by suspension, interchange the adjusting spindle [63] and the spring bolt [60], the compensator spring [61] and the locking screw [62].

Caution: If the self-centering stroke is too great, the workpiece will be damaged and premature roll breakage can result.

In case of NC adapters, this setting process is carried out using the two locking screws [87] (see page 55).

During this process, the locking screws are set and locked in such a way that the existing clearance, depending on the thread diameter max. 1 mm, permits each roll to touch the workpiece to therefore perfectly center the attachment.

9.0 Thread Rolling

Once all preparatory stages have been completed, you can start to produce threads.

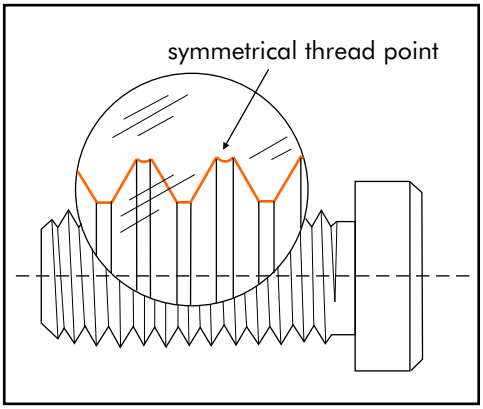
Never start work without correctly adjusted attachment. All machine functions must be 100% correct!

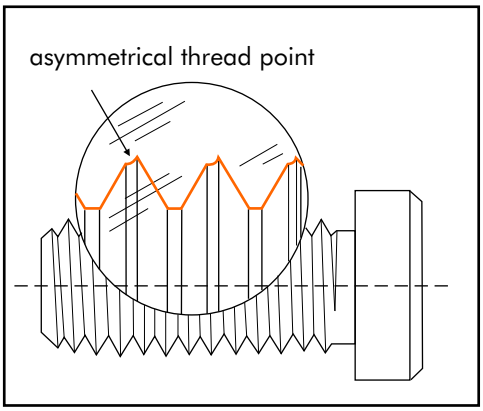
This means: The "thread rolling" cycle must run through fully automatically with the calculated advancement and at the planned speed. Rolling must never take place in the inching mode, in single record operation, at reduced speed or with a reduced advancement.
On completion, gauge the rolled threads and make any necessary corrections:

Note: The effective diameter of the thread is varied by the thread rolling attachment setting.

- **The major thread diameter is varied by altering the pre-machined diameter Q of the workpiece.**

9.1 Correcting the rolling attachment setting





If you are not happy with the sample thread, correct the attachment setting. Normally, the thread rolling attachment can be left mounted on the machine for this purpose. If you are producing a cylindrical thread, and it turns out to be tapered, or if, in the case of a tapered thread the taper deviates from the, target value, **both** geared arms (or solid arms) must be adjusted **by the same amount**. If only **one** arm is adjusted, this can result in incorrect thread roll adjustment (markings »C« and »D«, see page 29).

After adjusting the thread rolling attachment arms, always check whether the roll pins can still be moved in the retaining holes.

It is advisable to take a closer look at the sample thread under the magnifying glass. If the thread rolls have been correctly set, the thread crests look symmetrical, as indicated in the first diagram. If you discover one-sided formation of the thread crest (picture below), adjust the micrometer screw once again.

9.2 Exchanging the thread rolls

If you have to insert new thread rolls for the same thread dimension after the existing ones have come to the end of their life, take the thread rolling attachment out of the adapter. When inserting the rolls, follow the instructions on pages 26 and 29.

Due to manufacturing tolerances in the production of thread rolls, it is possible that minimal adjustment may be necessary at the thread rolling attachment arms. Bring the »C« and »D« markings into alignment using the micrometer screw as described on pages 26 to 29.

If you are changing to a **different** thread dimension, take the attachment and the adapter off the cross slide. Remount and adjust again from scratch.

9.3 Service life of thread rolls

Roll life depends on a variety of factors, and normally ranges between several thousand to a hundred thousand threads per set of rolls. Certain factors affecting the service life of rolls to varying degrees include:

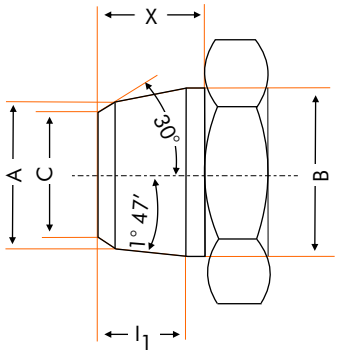
- Material strength and elongation δ_5
- Material hardening during cold forming
- Fill-out level of the thread (overloading)
- Correct starting and run out chamfer
- Correct tool setting and mounting in the machine
- Roll speed and advance of thread rolling attachment
- Quality and feed of lubricant
- »Chip-free«, i.e. ensure there are no chips on the workpiece or the thread rolls before starting the rolling cycle.

Alongside several different types of starting materials for thread rolling, there are also several surface treatment types available. These are recommended from case to case on the basis of available experience. Delivery periods for specially produced rolls are naturally longer than for standard types. This should always be taken into account when ordering tools. The prices for special tools are listed.

10.0 Rolling Tapered Threads

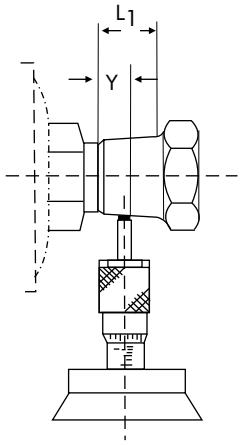
The explanations provided here on the subject of tapered threads refer exclusively to standardized thread reach l_1. For threads with different thread reach measurements, the appropriate drawings must be available which contain the necessary information on thread length, position of the measured plane and other requirements. Enter these measurements, which affect the special dimensions requested, in the table provided on page 42.

Pre-machined diameter for tapered Withworth pipe threads and NPT threads

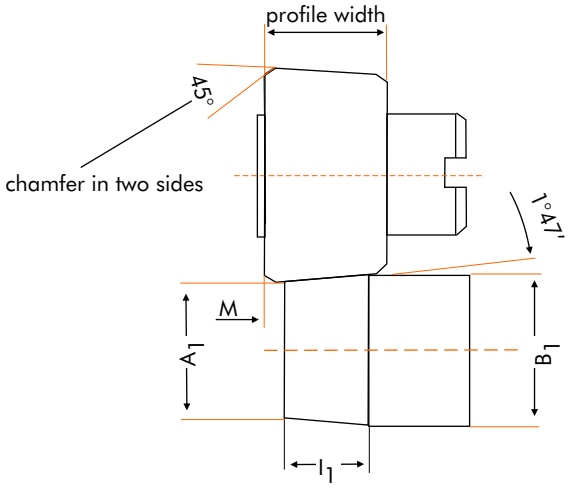


X = minimum dimension for workpieces with collar
l_1 = standardized thread reach

Distance Y
Distance Y is the dimension from the work face to the point of contact of the micrometer setting gauge.
The setting value E in the range tables G1 to G... is calculated on the basis of the workpiece diameter at Y.

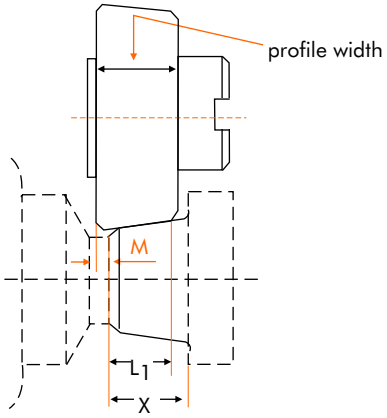


Gauge dimensions used for correct and precise adjustment of thread rolls in relation to each other (**flat bar steel gauges** with a thickness between 3 and 8 mm have proven successful).



M = Distance between roll face and gauge face

Distance M
Distance M must be adhered to at all costs during lateral alignment of the rolls. Only if she prescribed dimension is precisely correct is it possible for optimum interplay between the thread rolls and the work.



Caution: All roll positions which fail to comply with this regulation result in faulty threads and premature roll breakage!

Measurement tables to accompany page 41

Whitworth pipe threads DIN 2999 (K1:16)

Dimension	A	B	C	X	l_1	A_1	B_1	Profile width	M	Y
R 1/16″-28	6.89	7.29	6.10	8.1	6.5	6.31	6.71	8.8	1.2	3.25
R 1/8″-28	8.89	9.30	8.10	8.1	6.5	8.31	8.72	8.8	1.2	3.25
R 1/4″-19	11.92	12.53	10.80	12.0	9.7	11.07	11.66	13.0	1.7	4.85
R 3/8″-19	15.40	16.03	14.30	12.4	10.1	14.55	15.18	13.4	1.7	5.1
R 1/2″-14	19.28	20.10	17.85	16.3	13.2	18.11	18.94	17.7	2.3	6.6
R 3/4″-14	24.68	25.59	23.40	17.6	14.5	23.62	24.52	19.0	2.3	7.25
R 1″-11	31.12	32.17	29.40	20.8	16.8	29.64	30.69	22.6	2.9	8.4
R 11/4″-11	39.63	40.83	37.90	23.1	19.1	38.15	39.35	24.9	2.9	9.55
R11/2″-11	45.53	46.72	43.80	23.1	19.1	44.05	45.24	24.9	2.9	9.55

NPT threads (K1:16)

Dimension	A	B	C	X	l_1	A_1	B_1	Profile width	M	Y
1/16″-27	6.88	7.31	5.91	8.2	6.6	6.14	6.55	9.0	1.2	3.3
1/8″-27	9.24	9.65	8.17	8.3	6.7	8.48	8.89	9.1	1.2	3.4
¼″-18	12.11	12.77	10.76	12.7	10.2	10.99	11.63	13.7	1.8	5.1
3/8″-18	15.54	16.20	14.22	12.7	10.4	14.42	15.06	13.9	1.8	5.2
½″-14	19.25	20.11	17.57	16.6	13.6	17.80	18.66	18.1	2.3	6.8
¾″-14	24.58	25.45	22.91	16.7	13.8	23.13	24.00	18.3	2.3	6.9
1″-11½	30.83	31.90	28.85	21.4	17.3	29.05	30.14	22.8	2.8	8.7
1¼″-11½	39.54	40.66	37.59	21.8	18.0	37.79	38.91	23.5	2.8	9.0
1½″-11½	45.61	46.76	43.63	22.2	18.4	43.86	45.00	23.9	2.8	9.2

Special tapered threads according to customer drawingsh Kundenzeichnung

customer drawing	A	B	C	X	l_1	A_1	B_1	Profile width	M	

11.0 Special Applications For Thread Rolling Attachments

Alongside the production of threads, WAGNER® thread rolling attachments can also be used for other applications such as knurling.

The attachment can also be used for smoothing short shaft seats or ring-shaped premachined grooves (without pitch). If you are interested in this type of application, please enquire with us.

11.1 Knurling

Using the right knurling rolls, it is possible to produce knurls in accordance with DIN 82 and similar.
As synchronous running of the rolls is no longer required for this type of application, or can actually be a disadvantage, the compensating gear [3], the compensator block [2] and the compensator springs [6] must be removed. The micrometer screw [4] and the locking screws [7] should then be replaced, in order to avoid dirt from gaining access to the gear chamber..
When producing knurls, always remember that the pitch circle circumference is a whole multiple of the knurling pitch. Only then is it possible to achieve a perfect result..
This also means that not any optional knurl diameter can be achieved, but that it is necessary to coordinate the diameter to the relevant pitch.

When setting up the thread rolling attachment, set the distance between the rolls to:

▶ **pitch circle – ½**

It is easy to work out the gauge setting value by measuring the dimension from the rear edge of the dovetail to the front edge of the roll when the attachment is set, and taking away half the roll diameter and half the pre-machined diameter of the work. The result is the overall length of the setting gauge,. From this, take away the basic gauge dimension (page 41), and you will arrive at the setting value.
Further setting work is carried out analogous to the process for thread rolling.

▶ **Remember that the thread rolling attachment must be set precisely in relation to the centre line of the workpiece using the two locking screws at the adapter.** The maximum cleareance to either side should be 0.3 mm.
Roll speeds should be between 40 and 80 m/min.
Select an advance between 0.5 and 1.0 mm per revolution. Dwell of the rolls at the centre line of the work should be avoided.

Duty stroke S

The duty stroke S is calculated using the follwoing formula:

$$S\,(\text{duty stroke}) = \sqrt{\left(\frac{R}{2} + \frac{d_2}{2}\right)^2 - \left(\frac{R}{2} + \frac{d_3}{2}\right)^2}$$

R = Roll diameter
d_2 = Pitch circle diameter
d_3 = Distance between rolls (minor diameter)

▶ Caution: As also applies to thread rolling, the thread crests should not be completely filled in when knurling. Overloading the threads and flaking off of material are the result. It is not possible to achieve precisely specified flank angles.
Rolling of serrations is only possible under certain circumstances, as straight flanks cannot be produced. Should you have this type of requirement, please enquire.

12.0 Failures on rolled threads and their cause

Fault	Cause
Unsatisfactory surface finish; slivers or flakes on thread flanks	1. Rolls not in match 2. Centre line of rolls not parallel to centre line of workpiece 3. Cross slide guide worn 4. Bearing bolts or bearing bushes in adapter worn 5. Overloaded threads 6. Material not suitable for cold forming
»Drunken« threads	1. Rolls not in match 2. Centre line of rolls not parallel to centre line of workpiece 3. Work bending during rolling
Out of round thread	1. Out of round blanks 2. Excessive feed rate (insufficient workpiece revolutions) 3. Material not ductile enough for cold forming 4. Not rolling to centre line of workpiece
Tapered threads	1. Tapered pre-machined blank 2. Centre line of rolls not parallel to centre line of workpiece 3. workpiece bends away under strain
Poor thread form	1. Work bending during rolling 2. Rolls not in match 3. Too many work revolutions for rolling 4. Excessive or restricted travel of rolls
Crests not filled out because blank walls are too thin, dimension of bore changes	With major diameters up to appr. 20 mm, the wall thickness for thread rolling should be at least 4 times the thread penetration depth. With threads greater than 20 mm, the wall thickness should be at least 5 - 6 times the thread penetration. In marginal cases, check by trial and error.
Material particles are being rolled into the work profile. Roll profiles are deformed, particularly at the root.	1. Rolling attachment is operating in the line of dropping chips from other machining stations 2. Coolant has been soiled by material particles ▶ Use a magnetic or mechanical filter
High level of wear on thread roll bore and roll pins.	When using emulsions as coolants, ensure a grease content of 8 - 10 %. Thin emulsions are not suitable for rolling.

13.0 Care And Maintenance

Maintenance

If the thread rolling attachment has not been in use for some time, it must be dismantled and the components thoroughly cleaned and oiled. Deep groove ball bearing (no. 17) and anti-friction thrust bearing (no. 28) must be lubricated with gear grease. At regular intervals, they should be relubricated using the lubricating connection in the gear cover.

The same applies when you have been working with the attachment for some time, and you suspect that fine chips or other dirt hay been able to penetrate.

Cooling and lubriaction

Ensure sufficient feed of cooling lubricant. 1:10 - 1:20 emulsions and low-viscosity oils of the type used in metal cutting applications have proven successful.

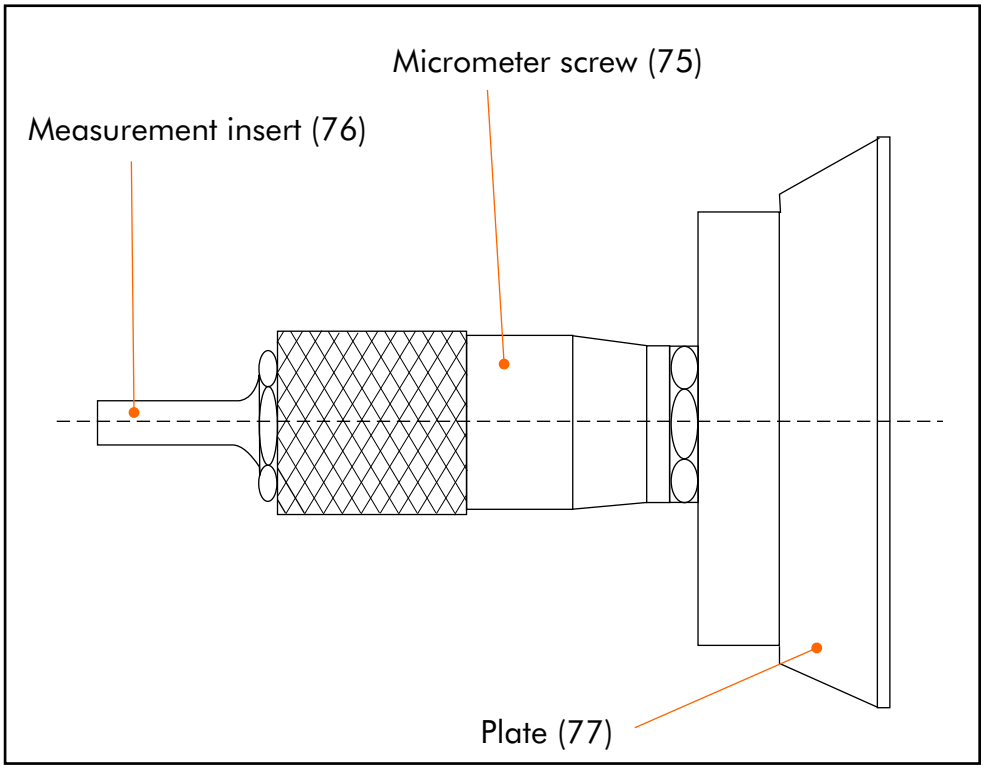
High-pressure additives tend to reduce friction between the thread rolls and the workpiece, and so make a contribution to increasing tool life. Good filtration of the cooling lubricant is very important to ensure that no particles (chips) can be rolled into the thread or gain access to the roll bearings.

If you require advice on the subject of coolants and lubricants, the advisory services of the mineral oil suppliers will be able to help you.

14.0 Accessories

14.1 Micrometer setting gauge

A special setting gauge is required for each attachment size. Plate (no. 77) is identical to the relevant tool sizes, and micrometer screw (no. 75) is designed in such a way that all the setting values »E« in the range tables G1 to G... are plus values. This means that the micrometer setting gauge is always extended by the dimension »E« beyond 0 (zero).

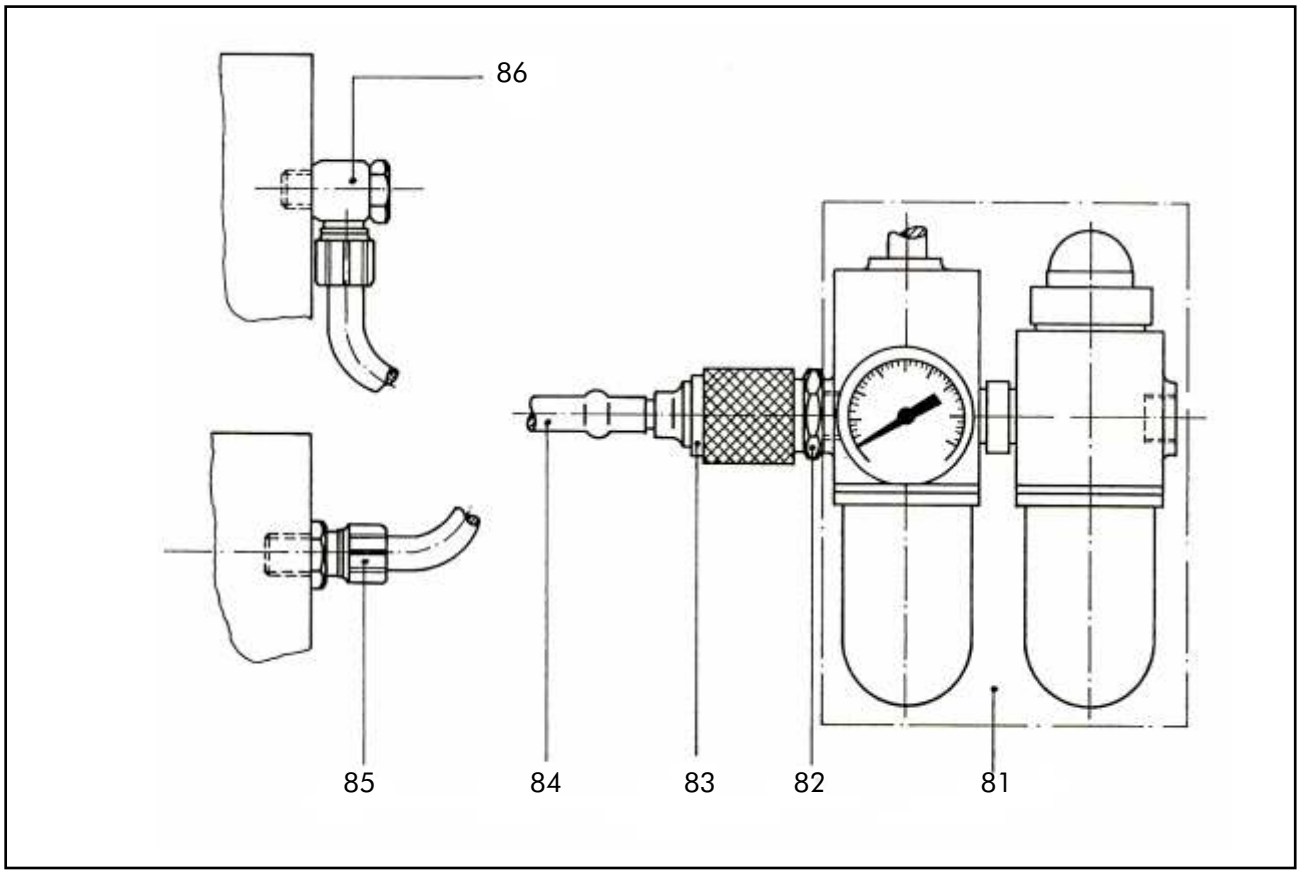


If the measurement insert (no. 76) is lost or worn, the gauge can easily be readjusted by taking into consideration the basic dimensions below (length of overall gauge on setting 0 at the micrometer screw).

Basic dimensions in the 0-position	
B 8-W	41.4 mm
B 10-W	55.9 mm
B 13-W	64.9 mm
B 15-W	59.5 mm
B 18-W	74.5 mm
B 36	86.4 mm
B 44	

14.2 Oil mist lubricator

This term describes a normal air supplying maintenance unit, which dewaters and easily oils the medium.
This componant, available as accessories kit, will be attached to the gear cover of the rolling attachment and delivers an adjustable working pressure of 0,5 – 1 bar. The excess power anticipates an ingress of lubricant and metal particles into the rolling attachment's gear and bearing positions.
We would strongly advise you to use this device, if the rolling attachments run on cross slides on emulsion.

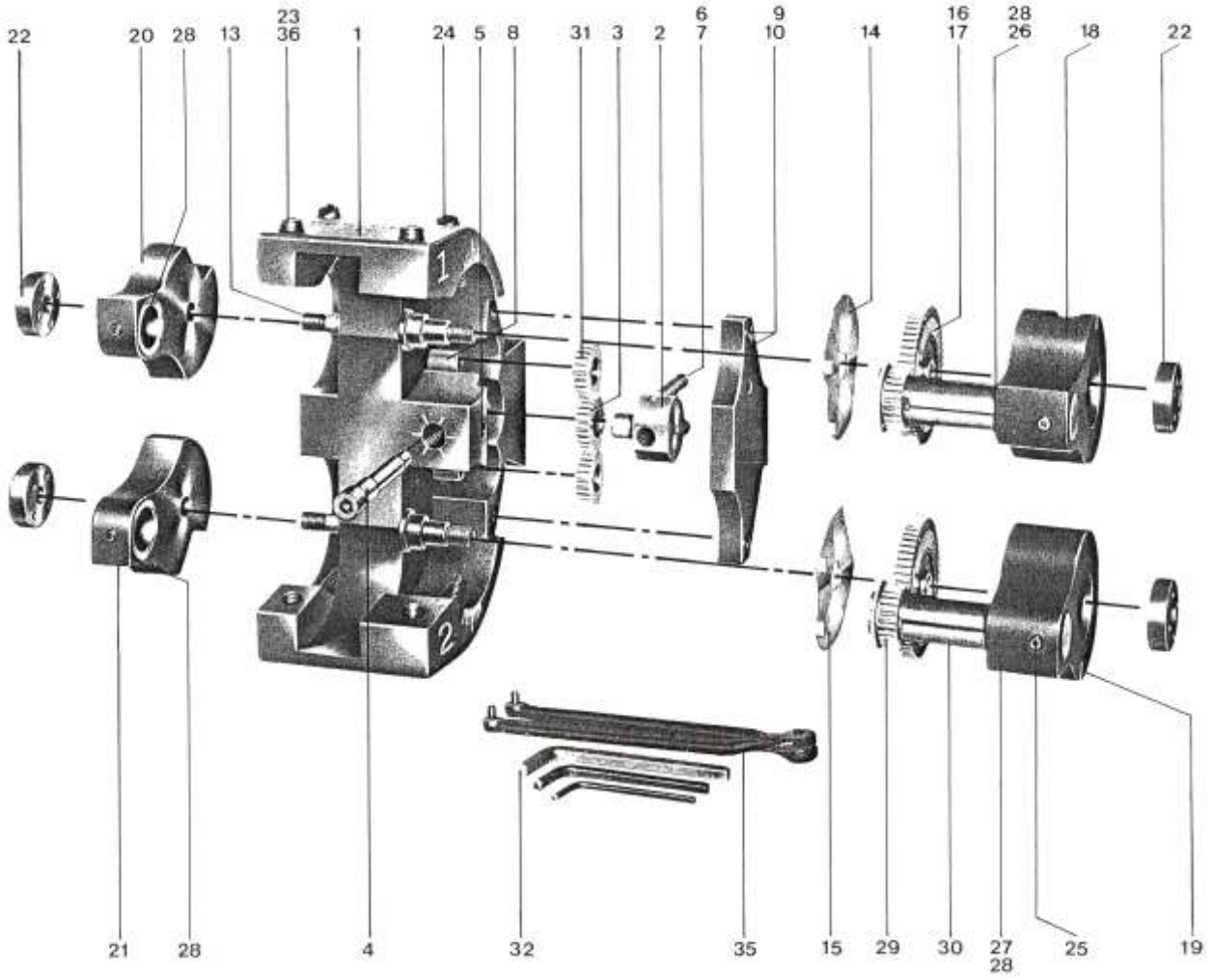


No.	Qty	Designation
81	1	Maintenance unit
82	1	Coupling socket
83	1	Connection plug
84	1	Hose assembly
85	1	fitting*
86	1	Swivel screw-fitting*

* Choose optionally, according to mounting conditions

15.0 Components And Their Arrangement

15.1 Thread Rolling Attachments B 8-W, B 10-W, B 13-W, B 18-W, B 36 (B 44)

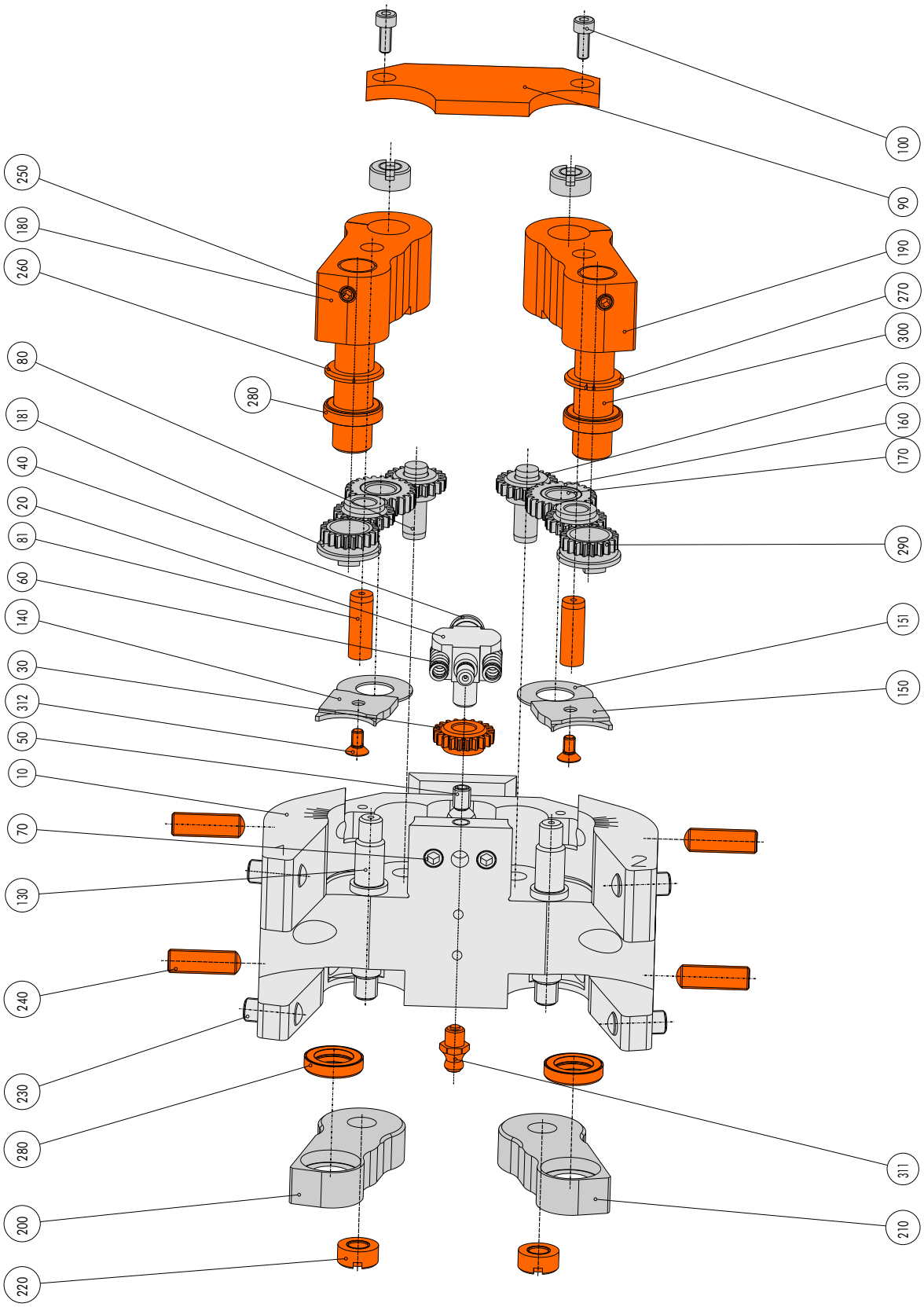


Thread Rolling Attachments B 8-W, B 10-W, B 13-W, B 18-W, B 36 (B 44)

Designation Order No.			B 8-W 716191	B 10-W 713848	B 13-W 713940	B 18-W 713869	B 36 731300
Pos.	**Qty.**	**Designation**	**Order number**				
Components							
1	1	Head body	716160	713849	713924	713870	731274
2	1	Compensator block	71620	713850	712159	713871	713770
3	1	Compensator gear	716211	713851	711976	713872	713815
4	1	Micrometer matchingscrew	716206	713852	712160	713873	713760
5	1	Locking screw	02045052	02045102	02045154	02045154	714311
6	2	Compensator spring	03310004	03310061	03310041	03310148	713765
7	2	Locking screw	02045102	02045153	02045203	02043204	714312
8	2	Bearing bolt for intermediate gear	716209	713853	712161	713874	713785
9	1	Gear cover A-NC version A-S version (see below)	730395	725703	724180	725896	731273
10	2	Fillister-head screw	02016002	02016002	02016002	02016002	714280
13	2	Bearing bolt	716208	713855	712171	713876	713790
14	1	Cover plate no. 1	716237	713856	712172	713877	713805
15	1	Cover plate no. 2	716238	713857	712173	713878	713810
16	2	Large idler gear	716212	713858	711977	713879	713795
17	2	Deep groove ball bearing	02401466	02401433	02402999	02401822	713800
18	1	Geared arm no. 1	716177	713859	713928	713880	714317
19	1	Geared arm no. 2	716178	713860	713930	713881	714318
20	1	Solid art no. 1	716179	713861	713929	713882	714319
21	1	Solid arm no. 2	716180	713862	713931	713883	714320
22	4	Slotted nut	02070011	721657	721656	721656	714321
23	4	Arm adjusting screw	724027	724029	724031	724031	713835
24	4	Arm locking screw	724028	724030	724032	724033	713840
25	2/4	Locking screw	02045052	02045102	02045153	02045153	714323
26	1	Spacer no. 1	716215	713866	712180	713887	713825
27	1	Spacer no. 2	716216	713867	712181	713888	713830
28	4	Anti-friction thrust bearing	03410003	03410005	03410007	03410009	713820
29	2	Drive gear	716213	713868	711975	713889	713775
30	2	Roll pin	713726	713727	712182	713728	713729
31	2	Intermediate gear (identical to no. 3)	716211	713851	711976	713872	713780
Accessories							
32	2/3	Hexagonal wrenches					
35	1	Spanner wrench	02679101	02679103	02679104	02679104	714275
36	4	Arm adjusting screw	724028	724030	724032	724033	713840
A-S version, gear cover assembly*			**780455**	**780456**	**780457**	**780459**	**780460**
109	1	Gear cover	716210	713854	712170	713875	714313
110	2	Fillister-head screws	02018014	02016004	02016004	02016005	714280
111	1	Locking screw	02045111	02045159	02045159	02045160	714315
112	1	Hexagonal nut	02061004	02061005	02061005	02061005	714316
113	1	Screw plug	02820075	02820075	02820075	02820075	
Accessories							
114	1	Hexagonal wrenches	02677005	02677005	02677005	02677005	
115	1	Single wrench	02673003	02673005	02673005	02673005	

* Is supplied with the A-S type adapter.
Must be exchanged for supplied component if required (see also fig. on page 52).

15.2 Thread Rolling Attachment B 15-W



Thread Rolling Attachment B 15-W

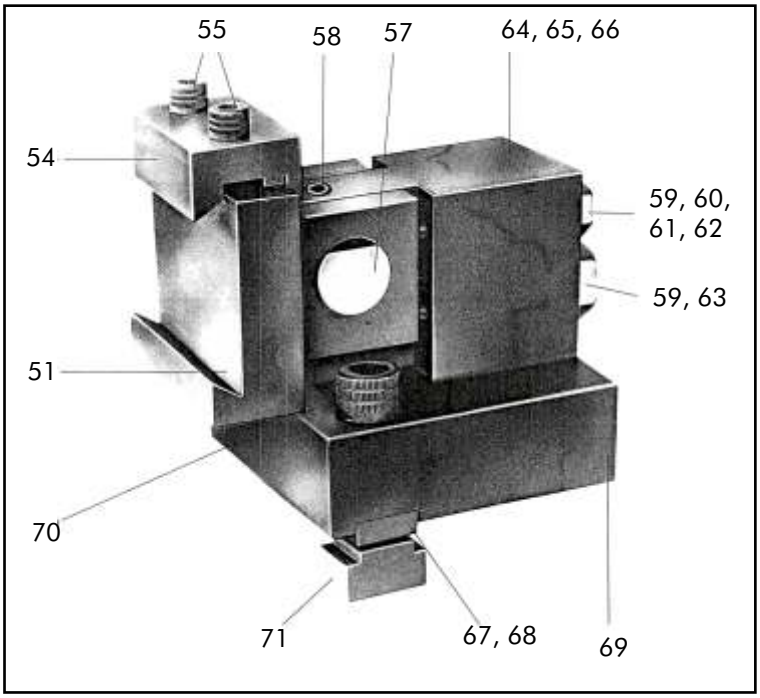
Designation Order number			B15-W 733454
Pos.	**Qty.**	**Designation**	**Order number**
Components			
1	1	Head body	733442
2	1	Compensator block	712159
3	1	Compensator gear	711976
4	1	Micrometer matchingscrew	733441
5	1	Locking screw	02045154
6	2	Compensator spring	03310041
7	2	Locking screw	02045203
8	2	Bearing bolt for intermediate gear	712161
8.1	2	Bearing bolt for intermediate gear	733452
9	1	Gear cover A-NC version A-S version (see below)	733448
10	2	Cylinder head screw	02016002
12	2	Countersink screw	02018011
13	2	Bearing bolt	733451
14	1	Cover plate no. 1	733974
15	1	Cover plate no. 2	733453
15.1	2	Large idler gear	733447
16	2	Deep groove ball bearing	733449
17	2	Geared arm no. 1	733450
18	1	Geared arm no. 2	733 445
19	1	Solid art no. 1	733446
20	1	Solid arm no. 2	733443
21	1	Slotted nut	733444
22	4	Arm adjusting screw	721657
23	4	Arm locking screw	724031
24	4	Locking screw	724032
25	2	Spacer no. 1	02045153
26	1	Spacer no. 2	712180
27	1	Anti-friction thrust bearing	712181
28	4	Drive gear	03410007
29	2	Roll pin	711975
30	2	Intermediate gear (identical to no. 3)	712182
31	4		711976
Accessories			
32	2	Hexagonal wrenches	
35	1	Spanner wrench	02679103
36	4	Arm adjusting screw	724032

A-S version, gear cover assembly*			780458
109	1	Gear cover	734360
110	2	Fillister-head screws	02015004
111	1	Locking screw	02045159
112	1	Hexagonal nut	02061005
113	1	Screw plug	02820075
Accessories			
114	1	Hexagonal wrenches	02677005
115	1	Single wrench	02673005

* Is supplied with the A-S type adapter.
Must be exchanged for supplied component if required (see also fig. on page 52).

15.3 A-S Adapter
Thread Rolling Attachment B 8-W, B 10-W, B 13-W, B 18-W, B 36, B 44

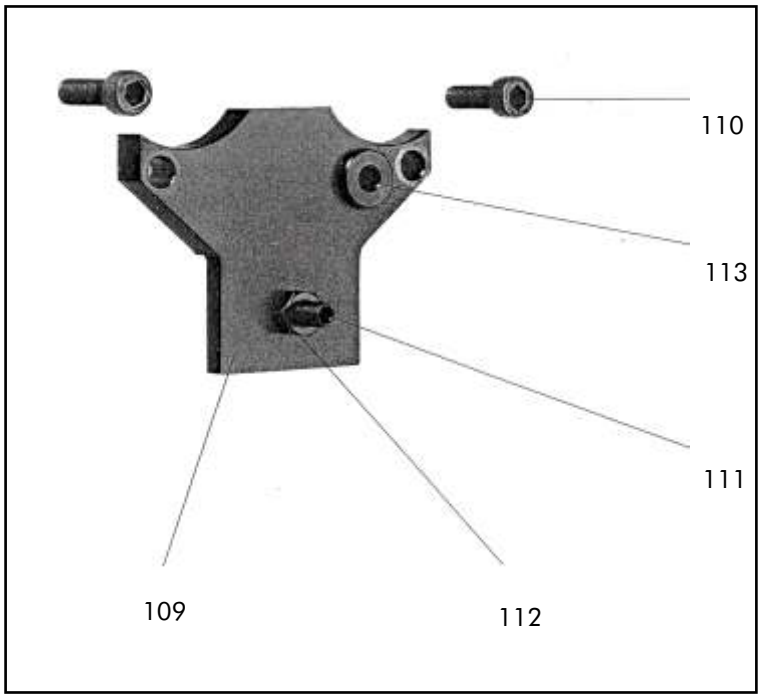
No.	Qty.	Designation
51	1	Console
54	1	Clamping
55	2	Cylinder head screw
57	1	Bearing pin
58	1	Threaded pin
59	2	Hexagonal nut
60	1	Spring bolt
61	1	Pressure spring
62	1	Threaded pin
63	1	Setting spindle
64	1	Bearing
65	2	Cylinder head screw
66	2	Cylinder pin
67	1	Parallel key (flat sliding blocks)
68	2	Cylinder head screw
69	1	Basic plate
70	2	Cylinder head screw
71	2	Screw nuts for T groove



109	1	Gear cover
110	2	Cylinder head screw
111	1	Locking screw
112	1	Hexagonal nut
113	1	Screw plug

CAUTION! Due to range conditions and the varied machine tool constructions, the figure on the right might differ.
Thus when ordering components, please specify the following items:

- the engraved adapter number
- the machine tool
- revolver with tool holder
- (or slide position)
- the rolling attachment size

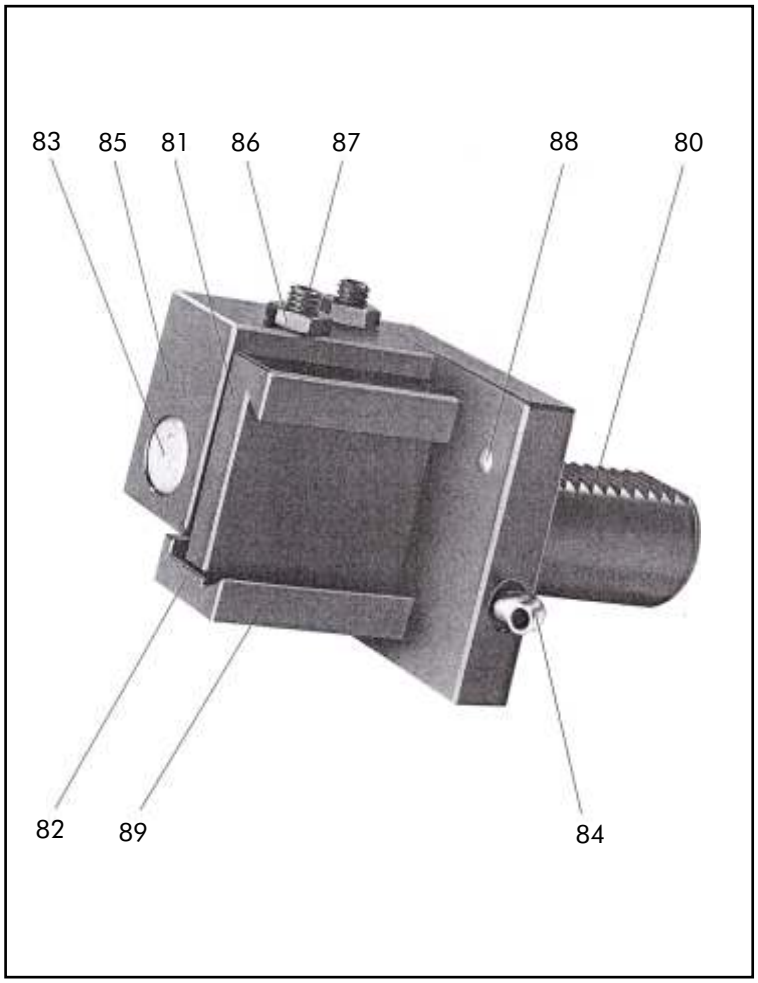


15.4 A-NC Adapter
Thread Rolling Attachment B 8-W, B 10-W, B 13-W, B 18-W, B 36

No.	Qty.	Designation
80	1	Bearing
81	1	Console
82	1	Clamping piece
83	1	Bearing bolt
84	1	Coolant pipe
85	1	Threaded pin
86	2	Hexagonal nut
87	2	Threaded pin
88	1	Cylinder pin
89	2	Cylinder head screw

CAUTION! Due to range conditions and the varied machine tool constructions, the figure on the right might differ.
Thus when ordering components, please specify the following items:

- the engraved adapter number
- the machine tool
- revolver with tool holder
- (or slide position)
- the rolling attachment size



Annex

Range Tables For Thread Rolling Attachments

Standard Metric Threads	G1
Fine Metric Threads	G2 - G10
Whitworth Pipe Threads DIN ISO 228	G11
NPT Threads	G12
Whitworth Pipe Threads DIN 2999 K1:16	G12
UST Threads	G13 - G21

RANGE TABLES FOR THREAD ROLLING ATTACHMENTS - METRIC THREADS

Standard Metric Threads DIN 13

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	13,00	**-	**-	**-	**-	-	-
	S	1,96	-	-	-	-	-	-
M 2,5	E	4,66	-	-	-	-	-	-
	B	12,84	-	-	-	-	-	-
	B+Z	12,84	-	-	-	-	-	-
	N	10,00	13,00	**-	**-	**-	-	-
	S	2,04	2,30	-	-	-	-	-
M 3,0	E	4,26	7,26	-	-	-	-	-
	B	11,70	15,72	-	-	-	-	-
	B+Z	11,70	21,32	-	-	-	-	-
	N	9,00	11,00	**-	**-	**-	-	-
	S	2,28	2,50	-	-	-	-	-
M 3,5	E	4,26	7,03	-	-	-	-	-
	B	13,19	15,51	-	-	-	-	-
	B+Z	13,19	21,11	-	-	-	-	-
	N	8,00	10,00	12,00	**-	**-	-	-
	S	2,49	2,76	3,00	-	-	-	-
M 4	E	4,13	7,00	12,19	-	-	-	-
	B	13,92	17,06	18,81	-	-	-	-
	B+Z	13,92	22,66	24,91	-	-	-	-
	N	7,00	8,00	10,00	-	-	-	-
	S	2,60	2,76	3,05	-	-	-	-
M 4,5	E	3,93	6,44	11,75	-	-	-	-
	B	14,24	14,52	17,19	-	-	-	-
	B+Z	14,24	20,12	23,29	-	-	-	-
	N	6,00	8,00	9,00	15,00	**-	-	-
	S	2,65	3,01	3,17	4,01	-	-	-
M 5	E	3,63	6,68	11,61	21,69	-	-	-
	B	13,62	18,57	17,91	43,24	-	-	-
	B+Z	13,62	24,17	24,01	43,24	-	-	-
	N	5,00	6,00	8,00	12,00	10,00	-	-
	S	3,00	3,24	3,68	4,42	4,06	-	-
M 6	E	3,27	5,94	11,53	21,32	16,06	-	-
	B	14,20	15,75	20,94	41,08	28,06	-	-
	B+Z	14,20	21,35	27,04	41,08	34,96	-	-
	N	4,00	5,00	6,00	10,00	8,00	-	-
	S	3,00	3,29	3,55	4,45	4,02	-	-
M 7	E	2,84	5,64	10,75	20,87	15,44	-	-
	B	14,17	16,71	17,87	42,01	26,99	-	-
	B+Z	14,17	22,31	23,97	42,01	33,89	-	-
	N	3,00	5,00	6,00	9,00	7,00	-	-
	S	3,19	3,90	4,22	5,04	4,51	-	-
M 8	E	2,01	5,62	10,89	20,41	15,04	-	-
	B	11,15	21,28	23,21	43,64	27,07	-	-
	B+Z	11,15	26,88	29,31	43,64	33,97	-	-
	N	3,00	4,00	5,00	8,00	6,00	8,00	-
	S	3,41	3,82	4,18	5,12	4,51	5,12	-
M 9	E	2,03	4,99	10,32	19,81	14,58	21,81	-
	B	15,15	19,40	22,40	45,83	27,26	37,95	-
	B+Z	15,15	25,07	28,50	45,83	34,16	44,85	-
	N	3,00	4,00	4,00	7,00	6,00	7,00	-
	S	3,92	4,38	4,38	5,54	5,18	5,54	-
M 10	E	1,84	4,81	9,48	19,48	15,02	21,02	-
	B	18,15	23,23	18,36	44,09	32,57	36,22	-
	B+Z	18,15	28,83	24,46	44,09	39,47	43,12	-

** available on request

Standard Metric Threads DIN 13

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	-2,00	3,00	4,00	6,00	5,00	7,00	-
	S	3,58	4,14	4,63	5,48	5,07	5,85	-
M 11	E	0,81	4,01	9,48	19,03	14,14	22,03	-
	B	12,57	18,66	23,36	42,51	29,99	44,22	-
	B+Z	12,57	24,26	29,46	42,51	36,89	51,12	-
	N	-2,00	3,00	4,00	6,00	5,00	6,00	-
	S	4,02	4,64	5,19	6,15	5,69	6,15	-
M 12	E	0,66	3,82	9,29	18,37	14,36	20,87	-
	B	14,80	21,65	27,12	47,81	34,52	39,93	-
	B+Z	14,80	27,25	33,22	47,81	41,42	46,83	-
	N	-	-2,00	3,00	5,00	4,00	5,00	-
	S	-	4,65	5,38	6,58	6,01	6,58	-
M 14	E	-	2,46	8,19	17,45	13,25	19,99	-
	B	-	16,53	23,77	48,00	32,94	40,13	-
	B+Z	-	22,13	29,87	48,00	39,84	47,03	-
	N	-	2,00	3,00	4,00	3,00	4,00	-
	S	-	5,02	5,80	6,49	5,80	6,49	-
M 16	E	-	1,95	7,47	16,57	11,62	18,58	-
	B	-	22,53	31,77	45,89	28,83	38,01	-
	B+Z	-	28,13	37,87	45,89	35,73	44,91	-
	N	-	-	-2,00	4,00	3,00	4,00	-
	S	-	-	5,92	7,64	6,83	7,64	-
M 18	E	-	-	6,23	15,16	11,66	19,09	-
	B	-	-	22,15	53,48	34,87	45,60	-
	B+Z	-	-	28,25	53,48	41,77	52,50	-
	N	-	-	2,00	3,00	3,00	3,00	-
	S	-	-	6,28	7,26	7,26	7,26	-
M 20	E	-	-	5,58	14,74	11,37	16,73	-
	B	-	-	26,15	45,81	42,87	37,94	-
	B+Z	-	-	34,25	45,81	49,77	44,84	-
	N	-	-	2,00	3,00	2,00	3,00	-
	S	-	-	6,63	7,66	6,63	7,66	-
M 22	E	-	-	4,60	13,13	9,16	17,14	-
	B	-	-	34,15	53,81	31,20	45,94	-
	B+Z	-	-	40,25	53,81	38,10	52,84	-
	N	-	-	-	-	2,00	3,00	-
	S	-	-	-	-	7,54	8,71	-
M 24	E	-	-	-	-	8,93	17,08	-
	B	-	-	-	-	35,65	51,93	-
	B+Z	-	-	-	-	42,55	58,83	-
	N	-	-	-	-	2,00	2,00	-
	S	-	-	-	-	8,06	8,06	-
M 27	E	-	-	-	-	8,14	13,76	-
	B	-	-	-	-	44,65	39,72	-
	B+Z	-	-	-	-	51,55	46,62	-
	N	-	-	-	-	**-	2,00	-
	S	-	-	-	-	-	9,15	-
M 30	E	-	-	-	-	-	13,76	-
	B	-	-	-	-	-	47,21	-
	B+Z	-	-	-	-	-	54,11	-
	N	-	-	-	-	**-	2,00	2,00
	S	-	-	-	-	-	9,62	9,62
M 33	E	-	-	-	-	-	13,26	19,01
	B	-	-	-	-	-	56,19	56,19
	B+Z	-	-	-	-	-	63,09	63,09

RANGE TABLES FOR THREAD ROLLING ATTACHMENTS - METRIC THREADS

Fine Metric Threads DIN 13

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	12,00	-	-	-	-	-	-
	S	1,70	-	-	-	-	-	-
M 2,5 x 0,35	E	4,51	-	-	-	-	-	-
	B	12,04	-	-	-	-	-	-
	B+Z	12,04	-	-	-	-	-	-
	N	10,00	12,00	-	-	-	-	-
	S	1,74	1,89	-	-	-	-	-
M 3,0 x 0,35	E	4,43	7,12	-	-	-	-	-
	B	13,23	15,02	-	-	-	-	-
	B+Z	13,23	20,62	-	-	-	-	-
	N	8,00	10,00	-	-	-	-	-
	S	1,72	1,90	-	-	-	-	-
M 3,5 x 0,35	E	4,07	6,90	-	-	-	-	-
	B	12,45	15,24	-	-	-	-	-
	B+Z	12,45	20,84	-	-	-	-	-
	N	9,00	11,00	-	-	-	-	-
	S	2,11	2,31	-	-	-	-	-
M 3,5 x 0,5	E	4,34	7,13	-	-	-	-	-
	B	14,17	16,68	-	-	-	-	-
	B+Z	14,17	22,28	-	-	-	-	-
	N	7,00	9,00	11,00	17,00	-	-	-
	S	1,74	1,95	2,13	2,61	-	-	-
M 4 x 0,35	E	3,94	6,88	12,15	22,09	-	-	-
	B	13,32	17,10	19,50	41,33	-	-	-
	B+Z	13,32	22,70	25,60	41,33	-	-	-
	N	7,00	9,00	11,00	18,00	-	-	-
	S	2,04	2,28	2,50	3,15	-	-	-
M 4 x 0,5	E	3,83	6,76	11,99	22,12	-	-	-
	B	12,17	15,68	17,80	42,31	-	-	-
	B+Z	12,17	21,28	23,90	42,31	-	-	-
	N	6,00	8,00	9,00	15,00	-	-	-
	S	1,74	1,97	2,08	2,63	-	-	-
M 4,5 x 0,35	E	3,67	6,72	11,61	21,82	-	-	-
	B	13,18	17,96	17,22	42,06	-	-	-
	B+Z	13,18	23,56	23,32	42,06	-	-	-
	N	6,00	8,00	10,00	15,00	-	-	-
	S	2,04	2,31	2,56	3,09	-	-	-
M 4,5 x 0,5	E	3,58	6,63	11,98	21,92	-	-	-
	B	12,16	16,67	19,80	39,80	-	-	-
	B+Z	12,16	22,27	25,90	39,80	-	-	-
	N	5,00	7,00	8,00	13,00	-	-	-
	S	1,70	1,97	2,09	2,60	-	-	-
M 5 x 0,35	E	3,26	6,46	11,41	21,60	-	-	-
	B	12,04	17,82	17,58	40,78	-	-	-
	B+Z	12,04	23,42	23,68	40,78	-	-	-
	N	6,00	7,00	9,00	14,00	-	-	-
	S	2,16	2,31	2,59	3,17	-	-	-
M 5 x 0,5	E	3,74	6,38	11,84	21,58	-	-	-
	B	15,66	16,67	20,80	43,30	-	-	-
	B+Z	15,66	22,27	26,90	43,30	-	-	-
	N	6,00	7,00	9,00	14,00	-	-	-
	S	2,59	2,76	3,09	3,79	-	-	-
M 5 x 0,75	E	3,65	6,22	11,66	21,75	-	-	-
	B	13,97	14,75	18,42	39,77	-	-	-
	B+Z	13,97	20,35	24,52	39,77	-	-	-

Fine Metric Threads DIN 13

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	5,00	6,00	8,00	12,00	9,00	-	-
	S	1,79	1,94	2,20	2,64	2,31	-	-
M 5,5 x 0,35	E	3,38	6,08	11,66	21,30	15,34	-	-
	B	15,04	16,68	22,08	42,64	24,28	-	-
	B+Z	15,04	22,28	28,18	42,64	31,18	-	-
	N	5,00	6,00	8,00	12,00	10,00	-	-
	S	2,11	2,28	2,59	3,11	2,86	-	-
M 5,5 x 0,5	E	3,34	6,01	11,59	21,40	16,10	-	-
	B	14,16	15,67	20,80	40,80	27,85	-	-
	B+Z	14,16	21,27	26,90	40,80	34,75	-	-
	N	5,00	7,00	8,00	13,00	-	-	-
	S	2,53	2,92	3,10	3,87	-	-	-
M 5,5 x 0,75	E	3,24	6,43	11,43	21,45	-	-	-
	B	12,70	18,75	18,64	42,50	-	-	-
	B+Z	12,70	24,35	24,74	42,50	-	-	-
	N	4,00	6,00	7,00	11,00	9,00	-	-
	S	1,71	2,03	2,17	2,66	2,42	-	-
M 6 x 0,35	E	2,81	6,16	11,30	21,03	16,04	-	-
	B	12,39	20,17	20,93	43,48	29,26	-	-
	B+Z	12,39	25,77	27,03	43,48	36,16	-	-
	N	4,00	6,00	7,00	11,00	9,00	-	-
	S	2,02	2,39	2,56	3,13	2,86	-	-
M 6 x 0,5	E	2,76	6,13	11,23	21,13	15,84	-	-
	B	11,64	19,14	19,76	41,74	27,80	-	-
	B+Z	11,64	24,74	25,86	41,74	34,70	-	-
	N	5,00	6,00	7,00	12,00	9,00	-	-
	S	2,66	2,87	3,07	3,91	3,43	-	-
M 6 x 0,75	E	3,33	6,06	11,09	21,14	15,48	-	-
	B	15,67	17,45	17,83	44,16	25,42	-	-
	B+Z	15,67	23,05	23,93	44,16	32,32	-	-
	N	4,00	5,00	6,00	10,00	8,00	-	-
	S	1,79	1,96	2,12	2,65	2,40	-	-
M 6,5 x 0,35	E	2,94	5,75	10,89	10,86	15,67	-	-
	B	14,89	17,53	18,79	43,34	28,12	-	-
	B+Z	14,89	23,13	24,89	43,34	35,02	-	-
	N	4,00	5,00	6,00	10,00	8,00	-	-
	S	2,11	2,31	2,50	3,13	2,83	-	-
M 6,5 x 0,5	E	2,91	5,71	10,82	20,96	15,49	-	-
	B	14,14	16,64	17,76	41,74	26,81	-	-
	B+Z	14,14	22,24	23,86	41,74	33,71	-	-
	N	4,00	5,00	7,00	11,00	8,00	-	-
	S	2,54	2,78	3,21	3,93	3,41	-	-
M 6,5 x 0,7	E	2,85	5,61	11,35	20,94	15,15	-	-
	B	12,91	15,18	21,83	44,90	24,65	-	-
	B+Z	12,91	20,78	27,93	44,90	31,55	-	-
	N	4,00	5,00	6,00	9,00	7,00	-	-
	S	1,86	2,04	2,20	2,63	2,35	-	-
M 7 x 0,35	E	2,90	5,77	11,00	20,64	15,03	-	-
	B	17,39	20,53	22,29	42,20	25,98	-	-
	B+Z	17,39	26,13	28,39	42,20	32,88	-	-
	N	4,00	5,00	6,00	9,00	7,00	10,00	-
	S	2,20	2,41	2,60	3,11	2,78	3,26	-
M 7 x 0,5	E	2,90	5,75	10,96	20,73	14,84	22,83	-
	B	16,64	19,64	21,26	40,75	24,81	39,37	-
	B+Z	16,64	25,24	27,36	40,75	31,71	46,27	-

RANGE TABLES FOR THREAD ROLLING ATTACHMENTS - METRIC THREADS

Fine Metric Threads DIN 13

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	4,00	5,00	6,00	10,00	8,00		-
	S	2,65	2,90	3,13	3,93	3,55		-
M 7 x 0,75	E	2,88	5,71	10,87	20,70	15,74		-
	B	15,41	18,18	19,57	94,63	29,15		-
	B+Z	15,91	23,73	25,67	94,63	36,05		-
	N	3,00	9,00	5,00	8,00	7,00	9,00	-
	S	1,72	1,93	2,11	2,59	2,94	2,73	-
M 7,5 x 0,35	E	2,19	5,13	10,38	20,44	15,49	22,52	-
	B	12,75	16,40	18,66	40,07	29,98	39,33	-
	B+Z	12,75	22,00	24,75	40,07	36,88	46,23	-
	N	3,00	9,00	5,00	9,00	7,00	9,00	-
	S	2,04	2,28	2,50	3,23	2,89	3,23	-
M 7,5 x 0,5	E	2,16	5,09	10,32	20,31	15,35	22,28	-
	B	12,14	15,65	17,76	45,75	28,81	37,87	-
	B+Z	12,14	21,25	23,86	95,75	35,71	94,77	-
	N	9,00	5,00	6,00	9,00	7,00		-
	S	2,75	3,01	3,25	3,89	3,48		-
M 7,5 x 0,75	E	2,82	5,70	10,96	20,50	15,09		-
	B	17,91	21,18	23,07	43,37	26,89		-
	B+Z	17,91	26,78	29,17	93,37	33,79		-
	N	4,00	5,00	6,00	9,00	7,00		-
	S	3,12	3,42	3,69	4,41	3,95		-
M 7,5 x 1	E	2,82	5,68	10,89	20,65	14,80		-
	B	16,67	19,71	21,37	40,97	24,96		-
	B+Z	16,57	25,31	27,97	90,97	31,86		-
	N	3,00	9,00	5,00	8,00	6,00	8,00	-
	S	1,78	1,99	2,19	2,68	2,36	2,68	-
M 8 x 0,35	E	2,18	5,13	10,95	20,06	14,60	21,73	-
	B	14,75	18,90	21,66	44,57	26,35	36,69	-
	B+Z	19,75	24,50	27,76	44,57	33,25	93,59	-
	N	3,00	4,00	5,00	8,00	6,00		-
	S	2,11	2,36	2,59	3,17	2,79		-
M 8 x 0,5	E	2,16	5,12	10,91	20,16	19,95		-
	B	14,19	18,15	20,76	43,25	25,31		-
	B+Z	14,19	23,75	26,86	93,25	32,21		-
	N	3,00	9,00	5,00	8,00	7,00	9,00	-
	S	2,55	2,85	3,12	3,82	3,61	4,03	-
M 8 x 0,75	E	2,13	5,07	10,39	20,31	15,52	22,63	-
	B	13,14	16,91	19,30	91,10	30,89	40,99	-
	B+Z	13,19	22,51	25,90	41,10	37,79	97,39	-
	N	3,00	9,00	5,00	9,00	7,00	9,00	-
	S	2,90	3,24	3,55	9,58	9,10	4,58	-
M 8 x 1	E	2,08	5,01	10,25	20,22	15,30	22,25	-
	B	12,14	15,68	17,83	45,97	28,96	38,10	-
	B+Z	12,14	21,28	23,93	95,97	35,86	95,00	-
	N	3,00	4,00	5,00	7,00	6,00	8,00	-
	S	1,84	2,06	2,26	2,60	2,44	2,76	-
M 8,5 x 0,35	E	2,10	5,07	10,43	19,92	14,97	22,37	-
	B	16,75	21,40	24,66	40,93	29,85	41,19	-
	B+Z	16,75	27,00	30,76	40,93	36,75	98,09	-
	N	3,00	9,00	5,00	7,00	6,00	8,00	-
	S	2,18	2,99	2,67	3,08	2,89	3,27	-
M 8,5 x 0,5	E	2,11	5,08	10,92	19,99	14,85	22,18	-
	B	16,14	20,65	23,76	39,76	28,81	39,88	-
	B+Z	16,14	26,25	29,86	39,76	35,71	46,78	-

Fine Metric Threads DIN 13

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	3,00	9,00	5,00	8,00	6,00	8,00	-
	S	2,64	2,95	3,23	3,95	3,49	3,95	-
M 8,5 x 0,75	E	2,11	5,07	10,39	19,90	14,63	21,84	-
	B	15,14	19,41	22,30	95,60	27,12	37,73	-
	B+Z	15,14	25,01	28,40	45,60	34,02	94,63	-
	N	3,00	4,00	5,00	8,00	6,00	8,00	-
	S	3,00	3,35	3,67	4,50	3,97	4,50	-
M 8,5 x 1	E	2,09	5,04	10,34	20,08	14,39	21,96	-
	B	14,19	18,18	20,83	43,44	25,42	35,56	-
	B+Z	14,14	23,78	26,93	43,44	32,32	92,46	-
	N	3,00	3,00	4,00	7,00	6,00	7,00	-
	S	1,90	1,90	2,12	2,68	2,51	2,68	-
M 9 x 0,35	E	1,97	4,23	9,67	19,55	15,23	21,31	-
	B	18,75	25,26	19,02	44,93	33,35	37,06	-
	B+Z	18,75	20,86	25,12	44,93	40,25	93,96	-
	N	3,00	4,00	4,00	7,00	6,00	7,00	-
	S	2,25	2,51	2,51	3,18	2,97	3,18	-
M 9 x 0,5	E	2,00	4,96	9,63	19,65	15,19	21,11	-
	B	18,14	23,15	18,27	43,76	32,31	35,88	-
	B+Z	18,14	28,75	29,37	43,76	39,21	42,78	-
	N	3,00	4,00	5,00	7,00	6,00	8,00	-
	S	2,72	3,04	3,33	3,85	3,60	4,08	-
M 9 x 0,75	E	2,02	4,99	10,36	19,79	14,98	22,49	-
	B	17,14	21,91	25,30	41,83	30,62	42,23	-
	B+Z	17,14	27,51	31,40	41,83	37,52	49,13	-
	N	3,00	4,00	5,00	7,00	6,00	8,00	-
	S	3,10	3,96	3,79	9,38	9,09	9,64	-
M 9 x 1	E	2,03	5,00	10,35	19,91	14,79	22,14	-
	B	16,14	20,68	23,83	39,90	28,92	40,06	-
	B+Z	16,19	26,28	29,93	39,90	35,82	96,96	-
	N	2,00	3,00	9,00	6,00	5,00	7,00	-
	S	1,74	2,00	2,24	2,65	2,46	2,83	-
M 10 x 0,35	E	0,99	9,17	9,69	19,11	14,35	22,27	-
	B	13,12	19,26	24,02	43,29	30,71	45,06	-
	B+Z	13,12	29,86	30,12	43,29	37,61	51,96	-
	N	2,00	3,00	4,00	6,00	5,00	7,00	-
	S	2,06	2,38	2,66	3,14	2,91	3,36	-
M 10 x 0,5	E	0,98	4,17	9,69	19,20	19,27	22,14	-
	B	12,65	18,65	23,27	42,26	29,82	43,88	-
	B+Z	12,65	29,25	29,37	92,26	36,72	50,78	-
	N	-2,00	3,00	9,00	6,00	5,00	7,00	-
	S	2,49	2,88	3,22	3,81	3,53	4,07	-
M 10 x 0,75	E	0,95	9,15	9,62	19,32	19,10	21,90	-
	B	11,87	17,65	22,04	40,57	28,36	41,96	-
	B+Z	11,87	23,25	28,14	90,57	35,26	48,86	-
	N	3,00	3,00	9,00	7,00	5,00	7,00	-
	S	3,28	3,28	3,67	4,69	9,02	4,64	-
M 10 x 1	E	1,75	9,13	9,59	19,11	13,93	21,63	-
	B	20,14	16,69	20,80	47,90	26,89	40,03	-
	B+Z	20,14	22,29	26,90	97,90	33,79	46,93	-
	N	3,00	3,00	9,00	7,00	5,00	7,00	2,00
	S	3,62	3,62	9,05	5,13	4,94	5,13	9,62
M 10 x 1,25	E	1,80	9,09	9,54	19,30	13,73	21,34	19,01
	B	19,15	15,66	19,59	96,02	25,46	38,15	56,19
	B+Z	19,15	21,26	25,69	46,02	32,36	95,05	63,09

RANGE TABLES FOR THREAD ROLLING ATTACHMENTS - METRIC THREADS

Fine Metric Threads DIN 13

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	2,00	3,00	3,00	6,00	5,00	6,00	-
	S	2,16	2,50	2,50	3,31	3,06	3,31	-
M 11 x 0,5	E	6,00	3,94	8,57	18,34	13,39	21,21	-
	B	15,65	22,65	17,77	49,26	35,82	41,39	-
	B+Z	15,65	28,25	23,87	49,26	92,72	48,29	-
	N	2,00	3,00	4,00	6,00	5,00	6,00	-
	S	2,62	3,03	3,39	4,01	3,71	4,01	-
M 11 x 0,75	E	0,83	3,98	9,44	18,54	14,50	20,98	-
	B	14,87	21,65	27,04	47,57	34,36	39,69	-
	B+Z	14,87	27,25	33,14	47,57	41,26	46,59	-
	N	2,00	3,00	4,00	6,00	5,00	6,00	-
	S	3,00	3,46	3,87	4,58	4,24	4,58	-
M 11 x 1	E	0,83	4,00	9,47	18,73	14,40	20,73	-
	B	14,10	20,64	25,80	45,87	32,89	38,00	-
	B+Z	14,10	26,24	31,90	45,87	39,79	44,90	-
	N	2,00	-2,00	3,00	5,00	4,00	5,00	-
	S	2,26	2,26	2,61	3,20	2,92	3,20	-
M 12 x 0,5	E	0,52	2,77	8,51	18,11	13,35	19,83	-
	B	18,64	15,15	21,76	44,75	30,31	36,87	-
	B+Z	18,64	20,75	27,86	44,75	37,21	43,77	-
	N	2,00	3,00	3,00	5,00	4,00	6,00	-
	S	2,75	3,17	3,17	3,89	3,55	4,20	-
M 12 x 0,75	E	0,57	3,62	8,50	18,25	13,23	21,65	-
	B	17,87	25,64	20,76	43,28	29,08	46,67	-
	B+Z	17,87	31,24	26,86	43,28	35,98	53,57	-
	N	2,00	3,00	3,00	5,00	4,00	6,00	-
	S	3,14	3,63	3,63	4,44	4,06	4,80	-
M 12 x 1	E	0,61	3,69	8,48	18,38	13,10	21,48	-
	B	17,09	24,63	19,75	41,82	27,84	44,97	-
	B+Z	17,09	30,23	25,85	41,82	34,74	51,87	-
	N	2,00	3,00	3,00	5,00	4,00	6,00	-
	S	3,48	4,01	4,01	4,92	4,49	5,31	-
M 12 x 1,25	E	0,63	3,74	8,45	18,50	12,96	21,30	-
	B	16,32	23,63	18,76	40,36	26,61	43,29	-
	B+Z	16,32	29,23	24,86	40,36	33,51	50,19	-
	N	2,00	3,00	4,00	6,00	5,00	6,00	-
	S	3,77	4,35	4,92	5,75	5,33	5,75	-
M 12 x 1,5	E	0,65	3,79	9,24	18,17	14,45	21,09	-
	B	15,56	22,64	28,15	49,48	35,96	41,61	-
	B+Z	15,56	28,24	34,25	49,48	42,86	48,51	-
	N	2,00	-2,00	3,00	5,00	4,00	5,00	-
	S	4,61	4,61	5,32	6,52	5,95	6,52	-
M 12,5 x 0,35	E	0,23	2,50	8,25	17,76	13,16	19,73	-
	B	18,89	15,40	22,26	45,75	31,06	37,87	-
	B+Z	18,89	21,00	28,36	45,75	37,96	44,77	-
	N	2,00	-2,00	3,00	5,00	4,00	5,00	-
	S	2,31	2,31	2,67	3,27	2,99	3,27	-
M 12,5 x 0,5	E	0,32	2,71	8,42	17,70	13,46	20,18	-
	B	20,14	16,65	23,76	47,75	32,81	39,87	-
	B+Z	20,14	22,25	29,86	47,75	39,71	46,77	-
	N	-	2,00	3,00	5,00	4,00	5,00	-
	S	-	2,36	2,73	3,34	3,05	3,34	-
M 13 x 0,5	E	-	2,62	8,30	17,23	13,53	20,47	-
	B	-	18,15	25,76	50,75	35,31	42,87	-
	B+Z	-	23,75	31,86	50,75	42,21	49,77	-

Fine Metric Threads DIN 13

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	2,00	-2,00	3,00	5,00	4,00	5,00	-
	S	2,87	2,87	3,31	4,06	3,70	4,06	-
M 13 x 0,75	E	0,17	2,63	8,33	17,43	13,47	20,30	-
	B	20,87	17,37	24,76	49,28	34,08	41,41	-
	B+Z	20,87	22,97	30,86	49,28	40,98	48,31	-
	N	2,00	-2,00	3,00	5,00	4,00	5,00	-
	S	3,28	3,28	3,79	4,64	4,24	4,64	-
M 13 x 1	E	0,25	2,63	8,35	17,62	13,39	20,12	-
	B	20,09	16,60	23,75	47,82	32,84	39,94	-
	B+Z	20,09	22,20	29,85	47,82	39,74	46,84	-
	N	2,00	-2,00	3,00	5,00	4,00	5,00	-
	S	3,94	3,94	4,55	5,57	5,09	5,57	-
M 13 x 1,5	E	0,36	2,60	8,35	17,94	13,20	19,70	-
	B	18,56	15,07	21,76	44,91	30,39	37,04	-
	B+Z	18,56	20,67	27,86	44,91	37,29	43,94	-
	N	-	2,00	3,00	4,00	3,00	5,00	-
	S	-	2,45	2,83	3,17	2,83	3,47	-
M 14 x 0,5	E	-	2,36	7,94	17,17	11,74	20,86	-
	B	-	21,15	29,76	43,25	26,82	48,87	-
	B+Z	-	26,75	35,86	43,25	33,72	55,77	-
	N	-	2,00	3,00	4,00	4,00	5,00	-
	S	-	2,98	3,44	3,85	3,85	4,22	-
M 14 x 0,75	E	-	2,39	8,00	17,29	13,50	20,75	-
	B	-	20,37	28,76	42,02	39,08	47,41	-
	B+Z	-	25,97	34,86	42,02	45,98	54,31	-
	N	-	2,00	3,00	4,00	4,00	5,00	-
	S	-	3,41	3,94	4,41	4,41	4,83	-
M 14 x 1	E	-	2,42	8,06	17,40	13,47	20,63	-
	B	-	19,60	27,75	40,79	37,84	45,94	-
	B+Z	-	25,20	33,85	40,79	44,74	52,84	-
	N	-	-2,00	3,00	5,00	4,00	5,00	-
	S	-	4,11	4,74	5,81	5,30	5,81	-
M 14 x 1,5	E	-	2,45	8,14	17,06	13,38	20,34	-
	B	-	18,07	25,76	50,91	35,39	43,04	-
	B+Z	-	23,67	31,86	50,91	42,29	49,94	-
	N	-	2,00	2,00	4,00	3,00	4,00	-
	S	-	2,54	2,54	3,28	2,94	3,28	-
M 15 x 0,5	E	-	2,00	6,75	16,42	11,92	19,03	-
	B	-	24,15	19,27	48,25	30,82	40,38	-
	B+Z	-	29,75	25,37	48,25	37,72	47,28	-
	N	-	2,00	2,00	4,00	3,00	4,00	-
	S	-	3,09	3,09	3,99	3,57	3,99	-
M 15 x 0,75	E	-	2,06	6,75	16,58	11,85	19,03	-
	B	-	23,37	18,50	47,02	29,81	40,38	-
	B+Z	-	28,97	24,60	47,02	36,71	47,28	-
	N	-	2,00	-2,00	4,00	3,00	4,00	-
	S	-	3,54	3,54	4,57	4,09	4,57	-
M 15 x 1	E	-	2,11	6,73	16,73	11,77	18,72	-
	B	-	22,60	17,72	45,79	28,81	37,91	-
	B+Z	-	28,20	23,82	45,79	35,71	44,81	-
	N	-	2,00	3,00	4,00	3,00	5,00	-
	S	-	4,27	4,93	5,51	4,93	6,04	-
M 15 x 1,25	E	-	2,20	7,78	17,01	11,58	20,73	-
	B	-	21,07	29,76	43,34	26,82	49,04	-
	B+Z	-	26,67	35,86	43,34	33,72	55,94	-

RANGE TABLES FOR THREAD ROLLING ATTACHMENTS - METRIC THREADS

Fine Metric Threads DIN 13

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	-	2,00	2,00	4,00	3,00	4,00	-
	S	-	2,63	2,63	3,39	3,04	3,39	-
M 16 x 0,5	E	-	1,54	6,55	15,50	11,97	19,37	-
	B	-	27,15	22,27	53,25	34,82	45,38	-
	B+Z	-	32,75	28,37	53,25	41,72	52,28	-
	N	-	2,00	2,00	4,00	3,00	4,00	-
	S	-	3,20	3,20	4,13	3,70	9,13	-
M 16 x 0,75	E	-	1,63	6,57	15,71	11,93	19,27	-
	B	-	26,37	21,50	52,02	33,81	49,15	-
	B+Z	-	31,97	27,50	52,02	40,71	51,05	-
	N	-	2,00	2,00	4,00	3,00	4,00	-
	S	-	3,67	3,67	4,73	4,23	4,73	-
M 16 x 1	E	-	1,71	6,58	15,90	11,39	19,15	-
	B	-	25,60	20,72	50,79	32,81	42,91	-
	B+Z	-	31,20	26,82	50,79	39,71	49,81	-
	N	-	2,00	-2,00	4,00	3,00	4,00	-
	S	-	4,42	4,42	5,71	5,11	5,71	-
M 16 x 1,5	E	-	1,84	5,59	16,25	11,77	18,89	-
	B	-	24,07	19,19	48,34	30,82	40,46	-
	B+Z	-	29,67	25,29	48,34	37,72	47,36	-
	N	-1,00	-	2,00	3,00	3,00	4,00	-
	S	2,21	-	2,71	3,13	3,13	3,50	-
M 17 x 0,5	E	-2,06	-	6,27	15,71	11,89	19,55	-
	B	17,14	-	25,27	41,76	38,82	50,38	-
	B+Z	17,14	-	31,37	41,76	45,72	57,28	-
	N	-1,00	-	2,00	3,00	3,00	4,00	-
	S	2,70	-	3,30	3,81	3,81	4,27	-
M 17 x 0,75	E	-2,02	-	6,31	15,82	11,89	19,48	-
	B	16,60	-	24,50	40,76	37,81	49,15	-
	B+Z	16,60	-	30,60	40,76	44,71	56,05	-
	N	-	-	2,00	3,00	3,00	4,00	-
	S	-	-	3,79	9,37	9,37	4,89	-
M 17 x 1	E	-	-	6,39	15,92	11,87	19,41	-
	B	-	-	23,72	39,75	36,81	47,91	-
	B+Z	-	-	29,32	39,75	43,71	54,81	-
	N	-	2,00	2,00	4,00	3,00	4,00	-
	S	-	4,57	4,57	5,90	5,28	5,90	-
M 17 x 1,5	E	-	1,38	6,39	15,39	11,82	19,23	-
	B	-	27,07	22,19	53,34	34,82	45,46	-
	B+Z	-	32,67	28,29	53,34	41,72	52,36	-
	N	-	2,00	-2,00	4,00	3,00	9,00	-
	S	-	5,20	5,20	6,71	6,00	6,71	-
M 17 x 2	E	-	1,55	6,42	15,73	11,73	19,01	-
	B	-	25,53	20,66	50,89	32,83	43,01	-
	B+Z	-	31,13	26,76	50,89	39,73	49,91	-
	N	-1,00	-	2,00	3,00	3,00	3,00	-
	S	2,28	-	2,79	3,23	3,23	3,23	-
M 18 x 0,5	E	-2,46	-	5,90	15,06	11,69	17,04	-
	B	19,14	-	28,27	45,76	42,82	37,89	-
	B+Z	19,14	-	34,37	45,76	49,72	44,79	-
	N	-1,00	-	2,00	3,00	3,00	4,00	-
	S	2,74	-	3,35	3,87	3,87	4,33	-
M 18 x 0,75	E	-2,39	-	5,97	15,20	11,72	19,54	-
	B	18,59	-	27,48	44,73	41,79	54,11	-
	B+Z	18,59	-	33,58	44,73	48,69	61,01	-

Fine Metric Threads DIN 13

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	-1,00	-	2,00	2,00	3,00	3,00	-
	S	3,19	-	3,90	4,51	9,51	5,04	-
M 18 x 1	E	-2,33	-	6,02	15,32	11,73	19,50	-
	B	18,06	-	26,72	93,75	90,81	52,91	-
	B+Z	18,06	-	32,82	43,75	47,71	59,81	-
	N	-	-	3,00	3,00	4,00	4,00	-
	S	-	-	4,72	5,45	5,45	6,09	-
M 18 x 1,5	E	-	-	6,11	15,55	11,79	19,40	-
	B	-	-	25,19	91,76	38,82	50,46	-
	B+Z	-	-	31,29	41,76	45,72	57,36	-
	N	-	-	2,00	3,00	3,00	4,00	-
	S	-	-	5,37	6,20	6,20	6,93	-
M 18 x 2	E	-	-	6,18	15,76	11,71	19,26	-
	B	-	-	23,66	39,77	36,83	48,01	-
	B+Z	-	-	29,76	39,77	93,73	59,91	-
	N	-1,00	-1,00	2,00	3,00	2,00	3,00	-
	S	2,35	2,35	2,87	3,32	2,87	3,32	-
M 19 x 0,5	E	-2,91	-0,43	5,45	14,31	9,51	17,30	-
	B	21,14	17,65	31,27	49,76	28,32	41,89	-
	B+Z	21,14	23,25	37,37	49,76	35,22	48,79	-
	N	-1,00	-	2,00	3,00	2,00	3,00	-
	S	2,86	-	3,50	4,04	3,50	4,04	-
M 19 x 0,75	E	-2,83	-	5,53	19,47	9,46	17,21	-
	B	20,60	-	30,50	48,76	27,55	40,88	-
	B+Z	20,60	-	36,60	48,76	34,45	47,78	-
	N	-1,00	-	2,00	3,00	3,00	3,00	-
	S	3,28	-	4,02	4,64	4,64	4,64	-
M 19 x 1	E	-2,75	-	5,61	14,62	11,96	17,10	-
	B	20,06	-	29,72	47,75	44,81	39,88	-
	B+Z	20,06	-	35,82	47,75	51,71	46,78	-
	N	-	-	2,00	3,00	3,00	3,00	-
	S	-	-	9,86	5,61	5,61	5,61	-
M 19 x 1,5	E	-	-	5,74	14,90	11,53	16,88	-
	B	-	-	28,19	45,76	92,82	37,89	-
	B+Z	-	-	34,29	45,76	49,72	44,79	-
	N	-	-	2,00	3,00	3,00	4,00	-
	S	-	-	5,53	6,39	6,39	7,19	-
M 19 x 2	E	-	-	5,86	15,16	11,57	19,35	-
	B	-	-	26,66	43,77	40,83	53,01	-
	B+Z	-	-	32,76	43,77	47,73	59,91	-
	N	-	-1,00	2,00	3,00	2,00	3,00	-
	S	-	2,41	2,95	3,91	2,95	3,41	-
M 20 x 0,5	E	-	-0,75	4,92	13,45	9,50	17,45	-
	B	-	19,65	34,27	53,76	31,32	45,89	-
	B+Z	-	25,25	40,37	53,76	38,22	52,79	-
	N	-	-1,00	2,00	3,00	2,00	3,00	-
	S	-	2,94	3,60	4,15	3,60	4,15	-
M 20 x 0,75	E	-	-0,71	5,02	13,64	9,47	17,38	-
	B	-	19,11	33,50	52,76	30,55	44,88	-
	B+Z	-	24,71	39,60	52,76	37,45	51,78	-
	N	-	-	2,00	3,00	2,00	3,00	-
	S	-	-	4,13	4,76	4,13	4,76	-
M 20 x 1	E	-	-	5,12	13,82	9,43	17,31	-
	B	-	-	32,72	51,75	29,78	43,88	-
	B+Z	-	-	38,82	51,75	36,68	50,78	-

RANGE TABLES FOR THREAD ROLLING ATTACHMENTS - METRIC THREADS

Fine Metric Threads DIN 13

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	-1,00	-	2,00	3,00	* 2,00	3,00	-
	S	4,08	-	4,99	5,76	4,99	5,76	-
M 20 x 1,5	E	-3,07	-	5,29	14,15	9,34	17,14	-
	B	20,99	-	31,19	49,76	28,24	41,89	-
	B+Z	20,99	-	37,29	49,76	35,14	48,79	-
	N	-	-	2,00	3,00	2,00	3,00	-
	S	-	-	5,69	6,57	5,69	6,57	-
M 20 x 2	E	-	-	5,45	14,46	9,23	16,95	-
	B	-	-	29,66	47,77	26,71	39,90	-
	B+Z	-	-	35,76	47,77	33,61	46,80	-
	N	-	-1,00	-	3,00	2,00	3,00	-
	S	-	3,01	-	4,26	3,69	4,26	-
M 21 x 0,75	E	-	-1,06	-	12,70	9,40	17,45	-
	B	-	21,11	-	56,00	33,55	48,88	-
	B+Z	-	26,71	-	56,00	40,45	55,78	-
	N	-	-1,00	2,00	3,00	2,00	3,00	-
	S	-	3,46	4,23	4,89	4,23	4,89	-
M 21 x 1	E	-	-1,01	4,54	12,91	9,38	17,40	-
	B	-	20,57	35,72	55,00	32,78	47,88	-
	B+Z	-	26,17	41,82	55,00	39,68	54,78	-
	N	-	-	2,00	3,00	2,00	3,00	-
	S	-	-	5,12	5,92	5,12	5,92	-
M 21 x 1,5	E	-	-	4,76	13,29	9,33	17,29	-
	B	-	-	34,19	53,76	31,24	45,89	-
	B+Z	-	-	40,29	53,76	38,14	52,79	-
	N	-	-	2,00	3,00	2,00	3,00	-
	S	-	-	5,85	6,75	5,85	6,75	-
M 21 x 2	E	-	-	4,96	13,66	9,26	17,15	-
	B	-	-	32,66	51,77	29,71	43,90	-
	B+Z	-	-	38,76	51,77	36,61	50,80	-
	N	-	-1,00	-	2,00	2	3,00	-
	S	-	3,08	-	3,78	3,78	4,36	-
M 22 x 0,75	E	-	-1,45	-	13,33	9,26	17,41	-
	B	-	23,11	-	39,50	36,55	52,88	-
	B+Z	-	28,71	-	39,50	43,45	59,78	-
	N	-	-1,00	-	2,00	2,00	3,00	-
	S	-	3,54	-	4,34	4,34	5,01	-
M 22 x 1	E	-	-1,39	-	13,43	9,26	17,39	-
	B	-	22,57	-	38,72	35,78	51,88	-
	B+Z	-	28,17	-	38,72	42,68	58,78	-
	N	-	-	* 2,00	3,00	2,00	3,00	-
	S	-	-	5,33	6,07	5,25	6,07	-
M 22 x 1,5	E	-	-	4,15	12,33	9,25	17,33	-
	B	-	-	36,00	56,00	34,24	49,89	-
	B+Z	-	-	42,10	56,00	41,14	56,79	-
	N	-	-	2,00	3,00	2,00	3,00	-
	S	-	-	6,00	6,93	6,00	6,93	-
M 22 x 2	E	-	-	4,39	12,74	9,21	17,25	-
	B	-	-	35,66	55,00	32,71	47,90	-
	B+Z	-	-	41,76	55,00	39,61	54,80	-
	N	-	-1,00	-	2,00	2,00	3,00	-
	S	-	3,62	-	4,44	4,44	5,13	-
M 23 x 1	E	-	-1,81	-	12,88	9,06	17,28	-
	B	-	24,56	-	41,71	38,77	55,87	-
	B+Z		30,16	-	41,71	45,67	62,77	-

Fine Metric Threads DIN 13

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	-	-1,00	-	2,00	2,00	3,00	-
	S	-	4,39	-	5,38	5,38	6,21	-
M 23 x 1,5	E	-	-1,68	-	13,09	9,09	17,27	-
	B	-	23,48	-	40,17	37,23	53,87	-
	B+Z	-	29,08	-	40,17	44,13	60,77	-
	N	-	-	-	2,00	2,00	3,00	-
	S	-	-	-	6,15	6,15	7,10	-
M 23 x 2	E	-	-	-	13,27	9,09	17,23	-
	B	-	-	-	38,64	35,70	51,88	-
	B+Z	-	-	-	38,64	42,60	58,78	-
	N	-	-1,00	-	2,00	2,00	2,00	-
	S	-	3,71	-	4,54	4,54	4,54	-
M 24 x 1	E	-	-2,28	-	12,28	8,80	13,99	-
	B	-	26,56	-	44,71	41,77	36,84	-
	B+Z	-	32,16	-	44,71	48,67	43,74	-
	N	-	-1,00	-	2,00	2,00	3,00	-
	S	-	4,49	-	5,50	5,5	6,35	-
M 24 x 1,5	E	-	-2,12	-	12,51	8,86	17,10	-
	B	-	25,48	-	43,17	40,23	57,87	-
	B+Z	-	31,08	-	43,17	47,13	64,77	-
	N	-	-1,00	-	2,00	2	3	-
	S	-	5,13	-	6,29	6,29	7,26	-
M 24 x 2	E	-	-1,98	-	12,73	8,90	17,12	-
	B	-	24,41	-	41,64	38,70	55,88	-
	B+Z	-	30,01	-	41,64	45,60	62,78	-
	N	-	-	-	2,00	2,00	2	-
	S	-	-	-	4,64	4,64	4,64	-
M 25 x 1	E	-	-	-	11,62	8,46	14,10	-
	B	-	-	-	47,71	44,77	39,84	-
	B+Z	-	-	-	47,71	51,67	46,74	-
	N	-	-1,00	-	2,00	2,00	2,00	-
	S	-	4,59	-	5,62	5,62	5,62	-
M 25 x 1,5	E	-	-2,61	-	11,88	8,56	13,97	-
	B	-	27,48	-	46,17	43,23	38,30	-
	B+Z	-	33,08	-	46,17	50,13	45,20	-
	N	-	-1,00	-	2,00	2,00	2,00	-
	S	-	5,25	-	6,43	6,43	6,43	-
M 25 x 2	E	-	-2,44	-	12,13	8,63	13,82	-
	B	-	26,41	-	44,64	41,70	36,77	-
	B+Z	-	32,01	-	44,64	48,60	43,67	-
	N	-	-	-1,00	2,00	2,00	2,00	-
	S	-	-	3,86	4,73	4,73	4,73	-
M 26 x 1	E	-	-	1,97	10,91	8,06	14,14	-
	B	-	-	25,68	50,71	47,77	42,84	-
	B+Z	-	-	31,78	50,71	54,67	49,74	-
	N	-	-	-1,00	2,00	2,00	2,00	-
	S	-	-	4,69	5,74	5,74	5,74	-
M 26 x 1,5	E	-	-	2,08	11,20	8,19	14,04	-
	B	-	-	24,60	49,17	46,23	41,30	-
	B+Z	-	-	30,70	49,17	53,13	48,20	-
	N	-	-	-	2,00	2,00	2,00	-
	S	-	-	-	6,57	6,57	6,57	-
M 26 x 2	E	-	-	-	11,47	8,30	13,93	-
	B	-	-	-	47,64	44,70	39,77	-
	B+Z	-	-	-	47,64	51,60	46,67	-

RANGE TABLES FOR THREAD ROLLING ATTACHMENTS - METRIC THREADS

Fine Metric Threads DIN 13

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	-	-	-1,00	2,00	2,00	2,00	-
	S	-	-	3,94	4,83	4,83	4,83	-
M 27 x 1	E	-	-	1,56	10,13	7,60	14,12	-
	B	-	-	27,68	53,71	50,00	45,84	-
	B+Z	-	-	33,78	53,71	56,90	52,74	-
	N	-	-	-1,00	2,00	2,00	2,00	-
	S	-	-	4,78	5,86	5,86	5,86	-
M 27 x 1,5	E	-	-	1,69	10,45	7,76	14,05	-
	B	-	-	26,61	52,17	49,23	44,30	-
	B+Z	-	-	32,71	52,17	56,13	51,20	-
	N	-	-	-1,00	2,00	2,00	2,00	-
	S	-	-	4,19	5,13	5,13	5,13	-
M 27 x 2	E	-	-	1,84	10,68	7,92	14,11	-
	B	-	-	26,19	51,50	48,55	43,62	-
	B+Z	-	-	32,29	51,50	55,45	50,52	-
	N	-	-	-1,00	2,00	2,00	2,00	-
	S	-	-	4,01	4,92	4,92	4,92	-
M 28 x 1	E	-	-	1,11	9,29	7,06	14,03	-
	B	-	-	29,68	56,00	50,00	48,84	-
	B+Z	-	-	35,78	56,00	56,90	55,74	-
	N	-	-	-1,00	2,00	2,00	2,00	-
	S	-	-	4,87	5,97	5,97	5,97	-
M 28 x 1,5	E	-	-	1,26	9,64	7,26	14,00	-
	B	-	-	28,61	55,00	50,00	47,30	-
	B+Z	-	-	34,71	55,00	56,90	54,20	-
	N	-	-	-	2,00	2,00	2,00	-
	S	-	-	-	6,84	6,84	6,84	-
M 28 x 2	E	-	-	-	9,98	7,44	13,95	-
	B	-	-	-	53,64	50,00	95,77	-
	B+Z	-	-	-	53,64	56,90	52,67	-
	N	-	-	-	-	2,00	2,00	-
	S	-	-	-	-	8,22	8,22	-
M 28 x 3	E	-	-	-	-	7,74	13,80	-
	B	-	-	-	-	47,65	42,72	-
	B+Z	-	-	-	-	54,55	49,62	-
	N	-	-	-1,00	2,00	-1,00	2,00	-
	S	-	-	4,09	5,01	4,09	5,01	-
M 29 x 1	E	-	-	0,73	8,49	4,86	13,99	-
	B	-	-	31,68	57,00	28,74	51,84	-
	B+Z	-	-	37,78	57,00	35,69	58,74	-
	N	-	-	-1,00	2,00	-1,00	2,00	-
	S	-	-	4,97	6,08	4,97	6,08	-
M 29 x 1,5	E	-	-	0,90	8,88	4,84	13,99	-
	B	-	-	30,61	57,00	27,66	50,30	-
	B+Z	-	-	36,71	57,00	34,56	57,20	-
	N	-	-	1,00	*2,00	-1,00	2,00	-
	S	-	-	4,16	5,10	4,16	5,10	-
M 30 x 1	E	-	-	0,21	7,53	4,69	13,79	-
	B	-	-	33,68	58,00	30,74	54,84	-
	B+Z	-	-	39,78	58,00	37,64	61,74	-
	N	-	-	-1,00	2,00	-1,00	2,00	-
	S	-	-	5,06	6,19	5,06	6,19	-
M 30 x 1,5	E	-	-	0,39	7,95	4,69	13,81	-
	B	-	-	32,61	58,00	29,66	53,30	-
	B+Z	-	-	38,71	58,00	36,56	60,20	-

Fine Metric Threads DIN 13

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	-	-	-1,00	2,00	-1,00	2,00	-
	S	-	-	5,79	7,09	5,79	7,09	-
M 30 x 2	E	-	-	0,57	8,35	4,68	13,82	-
	B	-	-	31,53	57,00	28,58	51,77	-
	B+Z	-	-	37,63	57,00	35,48	58,67	-
	N	-	-	-	-	-	2,00	-
	S	-	-	-	-	-	8,54	-
M 30 x 3	E	-	-	-	-	-	13,80	-
	B	-	-	-	-	-	48,72	-
	B+Z	-	-	-	-	-	55,62	-
	N	-	-	1,00	1,00	-1,00	2,00	2,00
	S	-	-	4,23	4,23	4,23	5,18	5,18
M 31 x 1	E	-	-	-0,35	9,02	4,48	13,53	19,52
	B	-	-	35,68	35,68	32,74	57,84	57,89
	B+Z	-	-	41,78	35,68	39,64	64,74	64,74
	N	-	-	-1,00	-1,00	-1,00	2,00	2,00
	S	-	-	5,14	5,14	5,14	6,30	6,30
M 31 x 1,5	E	-	-	-0,14	9,17	4,50	13,59	19,35
	B	-	-	34,61	39,61	31,66	56,30	56,30
	B+Z	-	-	40,71	34,61	38,56	63,20	63,20
	N	-	-	-	1,00	-1,00	2,00	2,00
	S	-	-	-	4,30	4,30	5,27	5,27
M 32 x 1	E	-	-	-	8,53	4,24	13,22	19,64
	B	-	-	-	37,68	34,74	60,84	60,84
	B+Z	-	-	-	37,68	41,64	67,74	67,74
	N	-	-	-	1,00	-1,00	2,00	2,00
	S	-	-	-	5,23	5,23	6,41	6,41
M 32 x 1,5	E	-	-	-	8,70	4,28	13,30	19,50
	B	-	-	-	36,61	33,66	59,30	59,30
	B+Z	-	-	-	36,61	40,56	66,20	66,20
	N	-	-	-1,00	-1,00	-1,00	2,00	2,00
	S	-	-	5,99	5,99	5,99	7,34	7,34
M 32 x 2	E	-	-	-0,50	8,86	4,30	13,37	19,35
	B	-	-	35,53	35,53	32,58	57,77	57,77
	B+Z	-	-	41,63	35,53	39,48	64,67	64,67
	N	-	-	-	-	-1,00	2,00	-
	S	-	-	-	-	7,23	8,85	-
M 32 x 3	E	-	-	-	-	4,32	13,46	-
	B	-	-	-	-	30,45	54,72	-
	B+Z	-	-	-	-	37,35	61,62	-
	N	-	-	-	1,00	-1,00	2,00	2,00
	S	-	-	-	4,37	4,37	5,35	5,35
M 33 x 1	E	-	-	-	8,02	3,97	12,85	19,70
	B	-	-	-	39,68	36,74	63,84	63,84
	B+Z	-	-	-	39,68	43,64	70,74	70,74
	N	-	-	-	1,00	-1,00	2,00	2,00
	S	-	-	-	5,31	5,31	6,51	6,51
M 33 x 1,5	E	-	-	-	8,20	4,02	12,96	19,59
	B	-	-	-	38,61	35,66	62,30	62,30
	B+Z	-	-	-	38,61	42,56	69,20	69,20
	N	-	-	-	1,00	-1,00	2,00	2,00
	S	-	-	-	6,09	6,09	7,46	7,46
M 33 x 2	E	-	-	-	8,37	4,06	13,06	19,47
	B	-	-	-	37,53	34,58	60,77	60,77
	B+Z	-	-	-	37,53	41,48	67,67	67,67

RANGE TABLES FOR THREAD ROLLING ATTACHMENTS - METRIC THREADS

Fine Metric Threads DIN 13

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	-	-	-	-	-1,00	2,00	2,00
	S	-	-	-	-	7,35	9,00	9,00
M 33 x 3	E	-	-	-	-	4,12	13,20	19,17
	B	-	-	-	-	32,45	57,72	57,72
	B+Z	-	-	-	-	39,35	64,62	64,62
	N	-	-	-	1,00	1,00	2,00	2,00
	S	-	-	-	1,79	1,79	2,19	2,19
M 34 x 1	E	-	-	-	7,47	3,72	12,44	19,84
	B	-	-	-	42,34	39,40	67,00	67,69
	B+Z	-	-	-	42,34	46,30	73,90	74,59
	N	-	-	-	1,00	-1,00	2,00	2,00
	S	-	-	-	5,40	5,40	6,61	6,61
M 34 x 1,5	E	-	-	-	7,68	3,73	12,57	19,63
	B	-	-	-	40,61	37,66	65,30	65,30
	B+Z	-	-	-	40,61	44,56	72,20	72,20
	N	-	-	-	1,00	-1,00	2,00	2,00
	S	-	-	-	6,19	6,19	7,58	7,58
M 34 x 2	E	-	-	-	7,87	3,79	12,69	19,53
	B	-	-	-	39,53	36,58	63,77	63,77
	B+Z	-	-	-	39,53	43,48	70,67	70,67
	N	-	-	-	-	-1,00	2,00	2,00
	S	-	-	-	-	7,47	9,15	9,15
M 34 x 3	E	-	-	-	-	3,88	12,89	19,30
	B	-	-	-	-	34,45	60,72	60,72
	B+Z	-	-	-	-	41,35	67,62	67,62
	N	-	-	-	1,00	-1,00	2,00	2,00
	S	-	-	-	4,50	4,50	5,52	5,52
M 35 x 1	E	-	-	-	6,93	3,33	11,95	19,65
	B	-	-	-	43,68	40,74	67,00	69,84
	B+Z	-	-	-	43,68	47,64	73,90	76,74
	N	-	-	-	1,00	-1,00	2,00	2,00
	S	-	-	-	5,48	5,48	6,71	6,71
M 35 x 1,5	E	-	-	-	7,13	3,41	12,12	19,60
	B	-	-	-	42,61	39,66	67,00	68,30
	B+Z	-	-	-	42,61	46,56	73,90	75,20
	N	-	-	-	1,00	-1,00	2,00	2,00
	S	-	-	-	6,28	6,28	7,70	7,70
M 35 x 2	E	-	-	-	7,33	3,49	12,27	19,54
	B	-	-	-	41,53	38,58	66,77	66,77
	B+Z	-	-	-	41,53	45,48	73,67	73,67
	N	-	-	-	-	-1,00	2,00	2,00
	S	-	-	-	-	7,59	9,30	9,30
M 35 x 3	E	-	-	-	-	3,62	12,53	19,36
	B	-	-	-	-	36,95	63,72	63,72
	B+Z	-	-	-	-	43,35	70,62	70,62
	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	4,57	4,57	4,57	-
M 36 x 1	E	-	-	-	6,39	2,96	8,30	-
	B	-	-	-	45,68	42,74	37,81	-
	B+Z	-	-	-	45,68	49,64	44,71	-
	N	-	-	-	1,00	-1,00	-1,00	-
	S	-	-	-	5,56	5,56	5,56	-
M 36 x 1,5	E	-	-	-	6,56	3,06	8,24	-
	B	-	-	-	44,61	41,66	36,73	-
	B+Z	-	-	-	44,61	48,56	43,63	-

Fine Metric Threads DIN 13

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	-	-	-	1,00	-1,00	2,00	2,00
	S	-	-	-	6,38	6,38	7,81	7,81
M 36 x 2	E	-	-	-	6,77	3,16	11,79	19,48
	B	-	-	-	43,53	40,58	67,00	69,77
	B+Z	-	-	-	43,53	47,48	73,90	76,67
	N	-	-	-	-	-1,00	2,00	2,00
	S	-	-	-	-	7,71	9,44	9,44
M 36 x 3	E	-	-	-	-	3,32	12,11	19,37
	B	-	-	-	-	38,45	66,72	66,72
	B+Z	-	-	-	-	45,35	73,62	73,62
	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	4,64	4,64	4,64	-
M 37 x 1	E	-	-	-	5,73	2,57	8,20	-
	B	-	-	-	47,68	44,74	39,81	-
	B+Z	-	-	-	47,68	51,64	46,71	-
	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	5,64	5,64	5,64	-
M 37 x 1,5	E	-	-	-	5,96	2,68	8,16	-
	B	-	-	-	46,61	43,66	38,73	-
	B+Z	-	-	-	46,61	50,56	45,63	-
	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	9,70	4,70	4,70	-
M 38 x 1	E	-	-	-	5,09	2,14	8,06	-
	B	-	-	-	49,63	46,74	41,81	-
	B+Z	-	-	-	49,68	53,64	48,71	-
	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	5,72	5,72	5,72	-
M 38 x 1,5	E	-	-	-	5,34	2,27	8,04	-
	B	-	-	-	48,61	45,66	40,73	-
	B+Z	-	-	-	48,61	52,56	47,63	-
	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	6,56	6,56	6,56	-
M 38 x 2	E	-	-	-	5,58	2,40	8,01	-
	B	-	-	-	47,53	44,58	39,66	-
	B+Z	-	-	-	47,53	51,48	46,56	-
	N	-	-	-	-	-1,00	1,00	-
	S	-	-	-	-	7,93	7,93	-
M 38 x 3	E	-	-	-	-	2,62	7,92	-
	B	-	-	-	-	42,45	37,52	-
	B+Z	-	-	-	-	49,35	44,42	-
	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	4,76	4,76	4,76	-
M 39 x 1	E	-	-	-	4,43	1,68	7,90	-
	B	-	-	-	51,68	48,74	43,81	-
	B+Z	-	-	-	51,63	55,64	50,71	-
	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	5,80	5,80	5,80	-
M 39 x 1,5	E	-	-	-	4,69	1,83	7,89	-
	B	-	-	-	50,61	47,66	42,73	-
	B+Z	-	-	-	50,61	59,56	49,63	-
	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	6,65	6,65	6,65	-
M 39 x 2	E	-	-	-	4,94	1,93	7,88	-
	B	-	-	-	49,53	46,58	41,66	-
	B+Z	-	-	-	49,53	53,48	48,56	-

RANGE TABLES FOR THREAD ROLLING ATTACHMENTS - METRIC THREADS

Fine Metric Threads DIN 13

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
M 39 x 3	N	-	-	-	-	-1,00	-1,00	-
	S	-	-	-	-	8,05	8,05	-
	E	-	-	-	-	2,23	7,82	-
	B	-	-	-	-	44,45	39,52	-
	B+Z	-	-	-	-	51,35	46,42	-
M 39,5 x 0,5	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	3,41	3,41	3,91	-
	E	-	-	-	3,80	1,28	7,80	-
	B	-	-	-	53,77	50,00	45,90	-
	B+Z	-	-	-	53,77	56,90	52,80	-
M 40 x 1	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	4,82	4,82	4,82	-
	E	-	-	-	3,74	1,20	7,71	-
	B	-	-	-	53,68	50,00	45,81	-
	B+Z	-	-	-	53,68	56,90	52,71	-
M 40 x 1,5	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	5,87	5,87	5,87	-
	E	-	-	-	4,01	1,37	7,72	-
	B	-	-	-	52,61	49,66	44,73	-
	B+Z	-	-	-	52,61	56,56	51,63	-
M 40 x 2	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	6,74	6,74	6,74	-
	E	-	-	-	4,28	1,52	7,72	-
	B	-	-	-	51,53	48,58	43,66	-
	B+Z	-	-	-	41,53	55,48	50,56	-
M 40 x 3	N	-	-	-	-	-1,00	-1,00	-
	S	-	-	-	-	8,16	8,16	-
	E	-	-	-	-	1,81	7,69	-
	B	-	-	-	-	46,45	41,52	-
	B+Z	-	-	-	-	53,35	48,42	-
M 42 x 1	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	4,95	4,95	4,95	-
	E	-	-	-	2,27	0,14	7,26	-
	B	-	-	-	56,00	50,00	49,81	-
	B+Z	-	-	-	56,00	56,90	56,71	-
M 42 x 1,5	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	6,02	6,02	6,02	-
	E	-	-	-	2,58	0,34	7,29	-
	B	-	-	-	56,00	50,00	48,73	-
	B+Z	-	-	-	56,00	56,90	55,63	-
M 42 x 2	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	6,92	6,92	6,92	-
	E	-	-	-	2,88	0,53	7,32	-
	B	-	-	-	55,00	50,00	47,66	-
	B+Z	-	-	-	55,00	56,90	54,56	-
M 42 x 3	N	-	-	-	-	1,00	-1,00	-
	S	-	-	-	-	7,08	7,08	-
	E	-	-	-	-	1,13	7,55	-
	B	-	-	-	-	50,00	45,18	-
	B+Z	-	-	-	-	56,90	52,08	-
M 45 x 1,5	N	-	-	-	-	-	1,00	-
	S	-	-	-	-	-	6,24	-
	E	-	-	-	-	-	6,45	-
	B	-	-	-	-	-	54,73	-
	B+Z	-	-	-	-	-	61,63	-

Fine Metric Threads DIN 13

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
M 45 x 2	N	-	-	-	1,00	-	-1,00	-
	S	-	-	-	7,17	-	7,17	-
	E	-	-	-	0,56	-	6,52	-
	B	-	-	-	58,00	-	53,66	-
	B+Z	-	-	-	58,00	-	60,56	-
M 45 x 3	N	-	-	-	-	-	-1,00	-
	S	-	-	-	-	-	8,69	-
	E	-	-	-	-	-	6,63	-
	B	-	-	-	-	-	51,52	-
	B+Z	-	-	-	-	-	58,42	-
M 48 x 1,5	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	6,45	6,45
	E	-	-	-	-	-	5,39	11,79
	B	-	-	-	-	-	60,72	60,72
	B+Z	-	-	-	-	-	67,62	67,62
M 48 x 2	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	7,42	7,42
	E	-	-	-	-	-	5,49	11,75
	B	-	-	-	-	-	59,65	59,65
	B+Z	-	-	-	-	-	66,55	66,55
M 48 x 3	N	-	-	-	-	-	-1,00	-1,00
	S	-	-	-	-	-	8,99	8,99
	E	-	-	-	-	-	5,69	11,63
	B	-	-	-	-	-	57,51	57,51
	B+Z	-	-	-	-	-	64,41	64,41
M 50 x 1,5	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	6,59	6,59
	E	-	-	-	-	-	4,55	11,53
	B	-	-	-	-	-	64,72	64,72
	B+Z	-	-	-	-	-	71,62	71,62
M 50 x 2	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	7,58	7,58
	E	-	-	-	-	-	4,69	11,51
	B	-	-	-	-	-	63,65	63,65
	B+Z	-	-	-	-	-	70,55	70,55
M 50 x 3	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	9,19	9,19
	E	-	-	-	-	-	4,93	11,45
	B	-	-	-	-	-	61,51	61,51
	B+Z	-	-	-	-	-	68,41	68,41
M 52 x 1,5	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	6,73	6,73
	E	-	-	-	-	-	3,62	11,17
	B	-	-	-	-	-	67,00	68,72
	B+Z	-	-	-	-	-	73,90	75,62
M 52 x 2	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	7,73	7,73
	E	-	-	-	-	-	3,78	11,18
	B	-	-	-	-	-	67,00	67,65
	B+Z	-	-	-	-	-	73,90	74,55
M 52 x 3	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	9,38	9,38
	E	-	-	-	-	-	4,08	11,17
	B	-	-	-	-	-	65,51	65,51
	B+Z	-	-	-	-	-	72,41	72,41

RANGE TABLES FOR THREAD ROLLING ATTACHMENTS - METRIC THREADS

Fine Metric Threads DIN 13

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	6,92	6,92
M 55 x 1,5	E	-	-	-	-	-	2,05	10,44
	B	-	-	-	-	-	67,00	74,72
	B+Z	-	-	-	-	-	73,90	81,62
	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	7,96	7,96
M 55 x 2	E	-	-	-	-	-	2,25	10,49
	B	-	-	-	-	-	67,00	73,65
	B+Z	-	-	-	-	-	73,90	80,55
	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	9,66	9,66
M 55 x 3	E	-	-	-	-	-	2,62	10,56
	B	-	-	-	-	-	67,00	71,51
	B+Z	-	-	-	-	-	73,90	78,41
	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	6,99	6,99
M 56 x 1,5	E	-	-	-	-	-	1,48	10,15
	B	-	-	-	-	-	67,00	76,72
	B+Z	-	-	-	-	-	73,90	83,62
	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	8,03	8,03
M 56 x 2	E	-	-	-	-	-	1,69	10,21
	B	-	-	-	-	-	67,00	75,65
	B+Z	-	-	-	-	-	73,90	82,55
	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	9,76	9,76
M 56 x 3	E	-	-	-	-	-	2,09	10,31
	B	-	-	-	-	-	67,00	73,51
	B+Z	-	-	-	-	-	73,90	80,41
	N	-	-	-	-	-	-	1,00
	S	-	-	-	-	-	-	7,11
M 58 x 1,5	E	-	-	-	-	-	-	9,51
	B	-	-	-	-	-	-	78,00
	B+Z	-	-	-	-	-	-	84,90
	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	8,18	8,18
M 58 x 2	E	-	-	-	-	-	0,50	9,59
	B	-	-	-	-	-	67,00	78,00
	B+Z	-	-	-	-	-	73,90	84,90
	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	9,94	9,94
M 58 x 3	E	-	-	-	-	-	0,95	9,74
	B	-	-	-	-	-	67,00	77,51
	B+Z	-	-	-	-	-	73,90	84,41
	N	-	-	-	-	-	-	1,00
	S	-	-	-	-	-	-	7,24
M 60 x 1,5	E	-	-	-	-	-	-	8,77
	B	-	-	-	-	-	-	78,00
	B+Z	-	-	-	-	-	-	84,90
	N	-	-	-	-	-	-	1,00
	S	-	-	-	-	-	-	8,33
M 60 x 2	E	-	-	-	-	-	-	8,88
	B	-	-	-	-	-	-	78,00
	B+Z	-	-	-	-	-	-	84,90

Fine Metric Threads DIN 13

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	-	-	-	-	-	-	1,00
	S	-	-	-	-	-	-	10,12
M 60 x 3	E	-	-	-	-	-	-	9,08
	B	-	-	-	-	-	-	78,00
	B+Z	-	-	-	-	-	-	84,90
	N	-	-	-	-	-	-	1,00
	S	-	-	-	-	-	-	7,36
M 62 x 1,5	E	-	-	-	-	-	-	7,95
	B	-	-	-	-	-	-	78,00
	B+Z	-	-	-	-	-	-	84,90
	N	-	-	-	-	-	-	1,00
	S	-	-	-	-	-	-	8,47
M 62 x 2	E	-	-	-	-	-	-	8,08
	B	-	-	-	-	-	-	78,00
	B+Z	-	-	-	-	-	-	84,90
	N	-	-	-	-	-	-	1,00
	S	-	-	-	-	-	-	10,29
M 62 x 3	E	-	-	-	-	-	-	8,33
	B	-	-	-	-	-	-	78,00
	B+Z	-	-	-	-	-	-	84,90
	N	-	-	-	-	-	-	1,00
	S	-	-	-	-	-	-	7,48
M 64 x 1,5	E	-	-	-	-	-	-	7,05
	B	-	-	-	-	-	-	78,00
	B+Z	-	-	-	-	-	-	84,90
	N	-	-	-	-	-	-	1,00
	S	-	-	-	-	-	-	8,61
M 64 x 2	E	-	-	-	-	-	-	7,20
	B	-	-	-	-	-	-	78,00
	B+Z	-	-	-	-	-	-	84,90
	N	-	-	-	-	-	-	1,00
	S	-	-	-	-	-	-	10,46
M 64 x 3	E	-	-	-	-	-	-	7,49
	B	-	-	-	-	-	-	78,00
	B+Z	-	-	-	-	-	-	84,90
	N	-	-	-	-	-	-	1,00
	S	-	-	-	-	-	-	8,68
M 65 x 2	E	-	-	-	-	-	-	6,73
	B	-	-	-	-	-	-	78,00
	B+Z	-	-	-	-	-	-	84,90
	N	-	-	-	-	-	-	1,00
	S	-	-	-	-	-	-	10,55
M 65 x 3	E	-	-	-	-	-	-	7,04
	B	-	-	-	-	-	-	78,00
	B+Z	-	-	-	-	-	-	84,90
	N	-	-	-	-	-	-	1,00
	S	-	-	-	-	-	-	8,88
M 68 x 2	E	-	-	-	-	-	-	5,18
	B	-	-	-	-	-	-	78,00
	B+Z	-	-	-	-	-	-	84,90
	N	-	-	-	-	-	-	1,00
	S	-	-	-	-	-	-	10,80
M 68 x 3	E	-	-	-	-	-	-	5,56
	B	-	-	-	-	-	-	78,00
	B+Z	-	-	-	-	-	-	84,90

RANGE TABLES FOR THREAD ROLLING ATTACHMENTS - METRIC THREADS

Whitworth Pipe Threads DIN ISO 228

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	3,00	3,00	4,00	7,00	5,00	7,00	-
	S	3,24	3,24	3,63	4,59	3,97	4,59	-
G 1/8	E	1,81	4,13	9,59	19,28	13,81	21,45	-
	B	19,44	15,95	19,93	46,51	25,85	38,64	-
	B+Z	19,44	21,55	26,03	46,51	32,75	45,54	-
	N	2,00	-2,00	3,00	5,00	4,00	5,00	-
	S	3,94	3,94	4,55	5,58	5,09	5,58	-
G 1/4	E	0,24	2,57	8,31	17,69	13,29	19,95	-
	B	19,54	16,05	23,07	46,86	32,02	38,99	-
	B+Z	19,54	21,65	29,17	46,86	38,92	45,89	-
	N	-	2,00	2,00	4,00	3,00	4,00	-
	S	-	4,49	4,49	5,79	5,18	5,79	-
G 3/8	E	-	1,47	6,44	15,51	11,82	19,19	-
	B	-	26,57	21,69	52,49	34,14	44,62	-
	B+Z	-	32,17	27,79	52,49	41,04	51,52	-
	N	-	-	2,00	3,00	2,00	3,00	-
	S	-	-	5,84	6,74	5,84	6,74	-
G 1/2	E	-	-	4,88	13,53	9,26	17,18	-
	B	-	-	33,10	52,36	30,15	44,48	-
	B+Z	-	-	39,20	52,36	37,05	51,38	-
	N	-	-	-	2,00	2,00	3,00	-
	S	-	-	-	6,13	6,13	7,07	-
G 5/8	E	-	-	-	13,22	9,08	17,23	-
	B	-	-	-	38,96	36,02	52,31	-
	B+Z	-	-	-	38,96	42,92	59,21	-
	N	-	-	-	2,00	2,00	2,00	-
	S	-	-	-	6,62	6,62	6,62	-
G 3/4	E	-	-	-	11,03	8,06	13,96	-
	B	-	-	-	49,55	46,61	41,68	-
	B+Z	-	-	-	49,55	53,51	48,58	-
	N	-	-	-1,00	2,00	-1,00	2,00	-
	S	-	-	5,80	7,10	5,80	7,10	-
G 7/8	E	-	-	0,37	7,98	4,62	13,76	-
	B	-	-	32,33	58,00	29,38	52,96	-
	B+Z	-	-	38,43	58,00	36,28	59,86	-
	N	-	-	-	-1,00	-1,00	2,00	2,00
	S	-	-	-	6,83	6,83	8,37	8,37
G 1	E	-	-	-	8,32	3,99	12,99	19,37
	B	-	-	-	37,33	34,38	60,55	60,55
	B+Z	-	-	-	37,33	41,28	67,45	67,45
	N	-	-	-	1,00	-1,00	-1,00	-
	S	-	-	-	7,32	7,32	7,32	-
G 1 1/8	E	-	-	-	5,76	2,48	7,96	-
	B	-	-	-	46,63	43,68	38,75	-
	B+Z	-	-	-	46,63	50,58	45,65	-
	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	7,72	7,72	7,72	-
G 1 1/4	E	-	-	-	3,09	0,66	7,31	-
	B	-	-	-	54,65	50,00	46,78	-
	B+Z	-	-	-	54,65	56,90	53,68	-
	N	-	-	-	1,00	-	-1,00	-
	S	-	-	-	7,95	-	7,95	-
G 1 3/8	E	-	-	-	1,28	-	6,72	-
	B	-	-	-	57,00	-	51,60	-
	B+Z	-	-	-	57,00	-	58,50	-

Whitworth Pipe Threads DIN ISO 228

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	8,28	8,28
G 1 1/2	E	-	-	-	-	-	5,60	11,69
	B	-	-	-	-	-	58,56	58,56
	B+Z	-	-	-	-	-	65,46	65,46
	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	8,80	8,80
G 1 3/4	E	-	-	-	-	-	2,99	10,78
	B	-	-	-	-	-	67,00	70,45
	B+Z	-	-	-	-	-	73,90	77,35
	N	-	-	-	-	-	-	1,00
	S	-	-	-	-	-	-	9,29
G 2	E	-	-	-	-	-	-	9,05
	B	-	-	-	-	-	-	78,00
	B+Z	-	-	-	-	-	-	84,90

RANGE TABLES FOR THREAD ROLLING ATTACHMENTS - METRIC THREADS

NPT-Threads

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	3,00	5,00	6,00	9,00	7,00	-	-
	S	3,20	3,91	4,22	5,04	4,51	-	-
1/16 NPT	E	2,02	5,62	10,87	20,41	14,99	-	-
	B	11,19	21,14	22,98	43,13	26,75	-	-
	B+Z	11,19	26,74	29,08	43,13	33,65	-	-
	N	-2,00	3,00	4,00	6,00	5,00	7,00	-
	S	3,22	3,71	4,15	4,90	4,54	5,24	-
1/8 NPT	E	0,90	4,09	9,55	19,31	13,93	21,65	-
	B	11,51	17,09	21,28	39,41	27,40	40,60	-
	B+Z	11,51	22,69	27,38	39,41	34,30	47,50	-
	N	-	-2,00	3,00	5,00	4,00	5,00	-
	S	-	4,52	5,21	6,37	5,82	6,37	-
1/4 NPT	E	-	2,52	8,23	17,54	13,24	19,91	-
	B	-	16,46	23,46	47,22	32,40	39,35	-
	B+Z	-	22,06	29,56	47,22	39,30	46,25	-
	N	-	2,00	2,00	4,00	3,00	4,00	-
	S	-	5,12	5,12	6,60	5,91	6,60	-
3/8 NPT	E	-	1,41	6,39	15,43	11,77	19,12	-
	B	-	26,74	21,86	52,47	34,22	44,59	-
	B+Z	-	32,34	27,96	52,47	41,12	51,49	-
	N	-	-	2,00	3,00	2,00	3,00	-
	S	-	-	6,47	7,45	6,47	7,45	-
1/2 NPT	E	-	-	4,91	13,58	9,24	17,11	-
	B	-	-	32,83	51,79	29,89	43,92	-
	B+Z	-	-	38,93	51,79	36,79	50,82	-
	N	-	-	-	2,00	2,00	2,00	-
	S	-	-	-	7,31	7,31	7,31	-
3/4 NPT	E	-	-	-	11,16	8,13	13,93	-
	B	-	-	-	48,81	45,86	40,93	-
	B+Z	-	-	-	48,81	52,76	47,83	-
	N	-	-	-	-	-1,00	2,00	2,00
	S	-	-	-	-	7,39	9,03	9,03
1 NPT	E	-	-	-	-	4,09	13,09	19,32
	B	-	-	-	-	33,97	59,53	59,53
	B+Z	-	-	-	-	40,87	66,43	66,43
	N	-	-	-	-	1,00	-1,00	-
	S	-	-	-	-	8,37	8,37	-
1 1/4 NPT	E	-	-	-	-	0,77	7,39	-
	B	-	-	-	-	50,00	46,53	-
	B+Z	-	-	-	-	56,90	53,43	-
	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	8,99	8,99
1 1/2 NPT	E	-	-	-	-	-	5,62	11,74
	B	-	-	-	-	-	58,69	58,69
	B+Z	-	-	-	-	-	65,59	65,59

Whitworth Pipe Threads DIN 2999 K1:16

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	3,00	4,00	6,00	9,00	7,00	-	-
	S	2,83	3,16	3,73	4,46	3,99	-	-
R 1/16	E	2,08	4,99	10,92	20,38	15,11	-	-
	B	11,53	14,85	23,58	43,99	27,44	-	-
	B+Z	11,53	20,45	29,68	43,99	34,34	-	-
	N	3,00	3,00	4,00	7,00	5,00	7,00	-
	S	3,21	3,21	3,59	4,53	3,93	4,53	-
R 1/8	E	1,81	4,14	9,59	19,26	13,81	21,43	-
	B	19,55	16,06	19,99	46,42	25,86	38,55	-
	B+Z	19,55	21,66	26,09	46,42	32,76	45,45	-
	N	-	-2,00	3,00	5,00	4,00	5,00	-
	S	-	3,92	4,52	5,52	5,04	5,52	-
R 1/4	E	-	2,60	8,32	17,68	13,29	19,93	-
	B	-	16,23	23,15	46,75	32,01	38,88	-
	B+Z	-	21,83	29,25	46,75	38,91	45,78	-
	N	-	2,00	2,00	4,00	3,00	4,00	-
	S	-	4,45	4,45	5,74	5,13	5,74	-
R 3/8	E	-	1,49	6,46	15,51	11,84	19,19	-
	B	-	26,70	21,83	52,41	34,17	44,54	-
	B+Z	-	32,30	27,93	52,41	41,07	51,44	-
	N	-	-	2,00	3,00	2,00	3,00	-
	S	-	-	5,80	6,69	5,80	6,69	-
R 1/2	E	-	-	4,90	13,52	9,31	17,20	-
	B	-	-	33,28	52,39	30,34	44,52	-
	B+Z	-	-	39,38	52,39	37,24	51,42	-
	N	-	-	-	2,00	2,00	2,00	-
	S	-	-	-	6,57	6,57	6,57	-
R 3/4	E	-	-	-	11,04	8,10	14,01	-
	B	-	-	-	49,62	46,67	41,74	-
	B+Z	-	-	-	49,62	53,57	48,64	-
	N	-	-	-	-	-1,00	2,00	2,00
	S	-	-	-	-	6,80	8,31	8,31
R 1	E	-	-	-	-	4,06	13,02	19,44
	B	-	-	-	-	34,81	60,79	60,79
	B+Z	-	-	-	-	41,71	67,69	67,69
	N	-	-	-	-	1,00	-1,00	-
	S	-	-	-	-	7,68	7,68	-
R 1 1/4	E	-	-	-	-	0,71	7,41	-
	B	-	-	-	-	50,00	47,06	-
	B+Z	-	-	-	-	56,90	53,96	-
	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	8,23	8,23
R 1 1/2	E	-	-	-	-	-	5,67	11,80
	B	-	-	-	-	-	58,85	58,85
	B+Z	-	-	-	-	-	65,75	65,75
	N	-	-	-	-	-	-	-
	S	-	-	-	-	-	-	-
R 2	E	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	B+Z	-	-	-	-	-	-	-

RANGE TABLES FOR THREAD ROLLING ATTACHMENTS - UST THREADS

UST-Threads

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	-	-	-	-	-	-	-
	S	-	-	-	-	-	-	-
2-56 UNC	E	-	-	-	-	-	-	-
	B	-	-	-	-	-	-	-
	B+Z	-	-	-	-	-	-	-
	N	15,00	-	-	-	-	-	-
	S	1,88	-	-	-	-	-	-
2-64 UNF	E	4,79	-	-	-	-	-	-
	B	12,84	-	-	-	-	-	-
	B+Z	12,84	-	-	-	-	-	-
	N	13,00	-	-	-	-	-	-
	S	2,13	-	-	-	-	-	-
3-48 UNC	E	4,57	-	-	-	-	-	-
	B	12,10	-	-	-	-	-	-
	B+Z	12,10	-	-	-	-	-	-
	N	13,00	-	-	-	-	-	-
	S	2,00	-	-	-	-	-	-
3-56 UNF	E	4,68	-	-	-	-	-	-
	B	13,08	-	-	-	-	-	-
	B+Z	13,08	-	-	-	-	-	-
	N	12,00	-	-	-	-	-	-
	S	2,38	-	-	-	-	-	-
4-40 UNC	E	4,57	-	-	-	-	-	-
	B	13,08	-	-	-	-	-	-
	B+Z	13,08	-	-	-	-	-	-
	N	11,00	-	-	-	-	-	-
	S	2,13	-	-	-	-	-	-
4-48 UNF	E	4,40	-	-	-	-	-	-
	B	12,05	-	-	-	-	-	-
	B+Z	12,05	-	-	-	-	-	-
	N	10,00	13,00	-	-	-	-	-
	S	2,34	2,64	-	-	-	-	-
5-40 UNC	E	4,30	7,31	-	-	-	-	-
	B	12,23	16,41	-	-	-	-	-
	B+Z	12,23	22,01	-	-	-	-	-
	N	10,00	12,00	-	-	-	-	-
	S	2,25	2,45	-	-	-	-	-
5-44 UNF	E	4,36	7,05	-	-	-	-	-
	B	12,85	14,58	-	-	-	-	-
	B+Z	12,85	20,18	-	-	-	-	-
	N	9,00	12,00	-	-	-	-	-
	S	2,58	2,94	-	-	-	-	-
6-32 UNC	E	4,07	7,17	-	-	-	-	-
	B	11,49	16,23	-	-	-	-	-
	B+Z	11,49	21,83	-	-	-	-	-
	N	9,00	11,00	-	-	-	-	-
	S	2,37	2,60	-	-	-	-	-
6-40 UNF	E	4,23	7,00	-	-	-	-	-
	B	12,98	15,26	-	-	-	-	-
	B+Z	12,98	20,86	-	-	-	-	-
	N	7,00	9,00	-	-	-	-	-
	S	2,57	2,87	-	-	-	-	-
8-32 UNC	E	3,71	6,63	-	-	-	-	-
	B	11,26	14,56	-	-	-	-	-
	B+Z	11,26	20,16	-	-	-	-	-

UST-Threads

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	7,00	9,00	11,00	-	-	-	-
	S	2,46	2,75	3,01	-	-	-	-
8-36 UNF	E	3,78	6,71	11,94	-	-	-	-
	B	11,94	15,42	17,50	-	-	-	-
	B+Z	11,94	21,02	23,60	-	-	-	-
	N	7,00	8,00	10,00	-	-	-	-
	S	3,14	3,33	3,68	-	-	-	-
10-24 UNC	E	3,90	6,42	11,74	-	-	-	-
	B	14,50	14,83	17,58	-	-	-	-
	B+Z	14,50	20,43	23,68	-	-	-	-
	N	6,00	8,00	10,00	15,00	-	-	-
	S	2,63	2,98	3,30	3,97	-	-	-
10-32 UNF	E	3,56	6,61	11,97	21,84	-	-	-
	B	12,47	17,10	20,34	40,63	-	-	-
	B+Z	12,47	22,70	26,44	40,63	-	-	-
	N	6,00	7,00	9,00	14,00	-	-	-
	S	3,19	3,41	3,81	4,66	-	-	-
12-24 UNC	E	3,65	6,28	11,74	21,55	-	-	-
	B	15,30	16,28	20,36	42,74	-	-	-
	B+Z	15,30	21,88	26,46	42,74	-	-	-
	N	5,00	7,00	8,00	13,00	-	-	-
	S	2,77	3,20	3,40	4,24	-	-	-
12-28 UNF	E	3,16	6,36	11,30	21,55	-	-	-
	B	11,70	17,43	17,17	40,23	-	-	-
	B+Z	11,70	23,03	23,27	40,23	-	-	-
	N	5,00	7,00	8,00	13,00	-	-	-
	S	2,62	3,03	3,21	4,00	-	-	-
12-32 UNEF	E	3,22	6,41	11,39	21,48	-	-	-
	B	12,37	18,31	18,15	41,74	-	-	-
	B+Z	12,37	23,91	24,25	41,74	-	-	-
	N	5,00	6,00	7,00	12,00	-	-	-
	S	3,46	3,74	4,00	5,10	-	-	-
1/4-20 UNC	E	3,24	5,94	10,93	21,20	-	-	-
	B	14,77	16,43	16,70	42,42	-	-	-
	B+Z	14,77	22,03	22,80	42,42	-	-	-
	N	4,00	6,00	7,00	11,00	9,00	-	-
	S	2,76	3,26	3,49	4,27	3,90	-	-
1/4-28 UNF	E	2,68	6,07	11,16	21,10	15,74	-	-
	B	11,40	18,86	19,46	41,36	27,46	-	-
	B+Z	11,40	24,46	25,56	41,36	34,36	-	-
	N	4,00	6,00	7,00	11,00	9,00	-	-
	S	2,60	3,08	3,29	4,03	3,68	-	-
1/4-32 UNEF	E	2,72	6,09	11,21	21,03	15,89	-	-
	B	11,95	19,61	20,31	42,63	28,52	-	-
	B+Z	11,95	25,21	26,41	42,63	35,42	-	-
	N	4,00	5,00	6,00	9,00	7,00	-	-
	S	3,78	4,14	4,47	5,34	4,78	-	-
5/16-18 UNC	E	2,75	5,61	10,84	20,55	14,79	-	-
	B	16,85	19,96	21,68	51,48	25,34	-	-
	B+Z	16,85	25,56	27,78	41,48	32,24	-	-
	N	4,00	5,00	6,00	9,00	7,00	-	-
	S	3,62	3,96	4,28	5,11	4,57	-	-
5/16-20 UN	E	2,75	5,63	10,87	20,47	14,95	-	-
	B	17,53	20,77	22,62	42,80	26,40	-	-
	B+Z	17,53	26,37	28,72	42,80	33,30	-	-

RANGE TABLES FOR THREAD ROLLING ATTACHMENTS - UST THREADS

UST-Threads

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	3,00	4,00	5,00	9,00	7,00	-	-
	S	2,99	3,34	3,66	4,73	4,23	-	-
5/16-24 UNF	E	2,05	4,98	10,20	20,32	15,18	-	-
	B	11,65	15,08	17,12	44,81	28,02	-	-
	B+Z	11,65	20,68	23,22	44,81	34,92	-	-
	N	3,00	4,00	5,00	9,00	7,00	9,00	-
	S	2,80	3,13	3,43	4,43	3,96	4,43	-
5/16-28 UN	E	2,09	5,03	10,27	20,20	15,33	22,31	-
	B	12,27	15,84	18,02	46,27	29,20	38,40	-
	B+Z	12,27	21,44	24,12	46,27	36,10	45,30	-
	N	3,00	4,00	5,00	8,00	7,00	9,00	-
	S	2,64	2,95	3,23	3,96	3,73	4,17	-
5/16-32 UNEF	E	2,12	5,06	10,31	20,37	15,43	22,48	-
	B	12,72	16,39	18,68	40,18	30,06	39,47	-
	B+Z	12,72	21,99	24,78	40,18	36,96	46,37	-
	N	3,00	4,00	5,00	7,00	6,00	8,00	-
	S	3,95	4,42	4,84	5,59	5,23	5,93	-
3/8-16 UNC	E	1,94	4,91	10,26	19,85	14,67	22,01	-
	B	15,89	20,42	23,57	39,62	28,65	39,76	-
	B+Z	15,89	26,02	29,67	39,62	35,55	46,66	-
	N	3,00	4,00	5,00	7,00	6,00	8,00	-
	S	3,59	4,02	4,40	5,08	4,75	5,39	-
3/8-20 UN	E	1,93	4,91	10,28	19,70	14,91	22,40	-
	B	17,15	21,97	25,41	42,03	30,78	42,47	-
	B+Z	17,15	27,57	31,51	42,03	37,68	49,37	-
	N	3,00	4,00	4,00	7,00	6,00	7,00	-
	S	3,32	3,71	3,71	4,70	4,39	4,70	-
3/8-24 UNF	E	1,91	4,88	9,54	19,58	15,05	21,01	-
	B	18,00	23,01	18,13	43,65	32,20	35,78	-
	B+Z	18,00	28,61	24,23	43,65	39,10	42,68	-
	N	3,00	3,00	4,00	7,00	6,00	7,00	-
	S	3,10	3,10	3,46	4,38	4,10	4,38	-
3/8-28 UNF	E	1,89	4,14	9,58	19,48	15,14	21,21	-
	B	18,60	15,11	18,87	44,81	33,21	36,93	-
	B+Z	18,60	20,71	24,97	44,81	40,11	43,83	-
	N	3,00	3,00	4,00	7,00	5,00	7,00	-
	S	2,91	2,91	3,26	4,12	3,57	4,12	-
3/8-32 UNEF	E	1,87	4,16	9,61	19,40	13,77	21,36	-
	B	19,06	15,57	19,44	45,69	25,25	37,82	-
	B+Z	19,06	21,17	25,54	45,69	32,15	44,72	-
	N	-	3,00	4,00	6,00	5,00	7,00	-
	S	-	4,59	5,14	6,08	5,63	6,50	-
7/16-14 UNC	E	-	3,96	9,44	19,04	14,04	21,91	-
	B	-	18,24	22,87	41,87	29,42	43,50	-
	B+Z	-	23,84	28,97	41,87	36,32	50,40	-
	N	-2,00	3,00	4,00	6,00	5,00	-	-
	S	3,74	4,32	4,84	5,72	5,30	-	-
7/16-16 UN	E	0,79	3,99	9,46	19,00	14,13	-	-
	B	12,61	18,73	23,46	42,67	30,12	-	-
	B+Z	12,61	24,33	29,56	42,67	37,02	-	-
	N	-2,00	3,00	4,00	6,00	5,00	6,00	-
	S	3,40	3,92	4,39	5,19	4,80	5,19	-
7/16-20 UNF	E	0,81	3,98	9,46	18,81	14,30	20,54	-
	B	13,59	19,99	25,01	44,80	31,96	36,93	-
	B+Z	13,59	25,59	31,11	44,80	38,86	43,83	-

UST-Threads

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	2,00	3,00	4,00	6,00	5,00	6,00	-
	S	2,92	3,37	3,77	4,46	4,13	4,46	-
7/16-28 UNEF	E	0,81	3,96	9,43	18,56	14,46	20,92	-
	B	14,72	21,46	26,81	47,27	34,10	39,40	-
	B+Z	14,72	27,06	32,91	47,27	41,00	46,30	-
	N	2,00	3,00	4,00	6,00	5,00	6,00	-
	S	2,74	3,17	3,54	4,19	3,88	4,19	-
7/16-32 UN	E	0,80	3,95	9,41	18,47	14,51	21,03	-
	B	15,07	21,92	27,38	48,05	34,77	40,18	-
	B+Z	15,07	27,52	33,48	48,05	41,67	47,08	-
	N	-	3,00	3,00	5,00	4,00	6,00	-
	S	-	5,10	5,10	6,25	5,70	6,75	-
1/2-13 UNC	E	-	3,62	8,33	18,38	12,85	21,21	-
	B	-	23,62	18,74	40,46	26,66	43,45	-
	B+Z	-	29,22	24,84	40,46	33,56	50,35	-
	N	2,00	3,00	3,00	5,00	4,00	6,00	-
	S	4,04	4,67	4,67	5,72	5,22	6,10	-
1/2-16 UN	E	0,47	3,54	8,37	18,21	13,05	21,47	-
	B	17,37	25,07	20,19	42,58	28,44	56,90	-
	B+Z	17,37	30,67	26,29	42,58	35,34	52,80	-
	N	2,00	3,00	3,00	5,00	4,00	5,00	-
	S	3,66	4,35	4,22	5,17	4,72	5,17	-
1/2-20 UNF	E	0,42	3,24	8,39	18,03	13,21	19,67	-
	B	18,35	26,20	21,46	44,43	30,00	36,55	-
	B+Z	18,35	31,80	27,56	44,43	36,90	43,45	-
	N	2,00	-2,00	3,00	5,00	4,00	5,00	-
	S	3,14	3,14	3,62	4,44	4,05	4,44	-
1/2-28 UNEF	E	0,34	2,67	8,40	17,81	13,36	19,99	-
	B	19,47	15,98	22,92	46,56	31,80	38,69	-
	B+Z	19,47	21,58	29,02	46,56	38,70	45,59	-
	N	2,00	-2,00	3,00	5,00	4,00	5,00	-
	S	2,95	2,95	3,40	4,17	3,80	4,17	-
1/2-32 UN	E	0,31	2,67	8,39	17,73	13,40	20,08	-
	B	19,83	16,34	23,38	47,23	32,36	39,36	-
	B+Z	19,83	21,94	29,48	47,23	39,26	46,26	-
	N	-	-2,00	3,00	5,00	4,00	5,00	-
	S	-	4,89	5,65	6,92	6,32	6,92	-
9/16-12 UNC	E	-	2,40	8,12	17,26	13,25	20,07	-
	B	-	17,03	24,45	49,05	33,80	41,17	-
	B+Z	-	22,63	30,55	49,05	40,70	48,07	-
	N	-	-2,00	3,00	4,00	4,00	5,00	-
	S	-	4,32	4,99	5,58	5,58	6,11	-
9/16-16 UN	E	-	2,39	8,06	17,47	13,38	20,42	-
	B	-	18,64	26,54	39,32	36,38	44,23	-
	B+Z	-	24,24	32,64	39,32	43,28	51,13	-
	N	-	2,00	3,00	4,00	4,00	5,00	-
	S	-	4,10	4,73	5,29	5,29	5,80	-
9/16-18 UNF	E	-	2,38	8,03	17,41	13,41	20,52	-
	B	-	19,18	27,24	40,18	37,23	45,24	-
	B+Z	-	24,78	33,34	40,18	44,13	52,14	-
	N	-	2,00	3,00	4,00	4,00	5,00	-
	S	-	3,90	4,51	5,04	5,04	5,52	-
9/16-20 UN	E	-	2,37	8,01	17,35	13,43	20,60	-
	B	-	19,62	27,82	40,89	37,94	46,08	-
	B+Z	-	25,22	33,92	40,89	44,84	52,98	-

RANGE TABLES FOR THREAD ROLLING ATTACHMENTS - UST THREADS

UST-Threads

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	-	2,00	3,00	4,00	4,00	5,00	-
	S	-	3,59	4,15	4,64	4,64	5,08	-
9/16-24 UNEF	E	-	2,35	7,96	17,25	13,45	20,70	-
	B	-	20,28	28,66	41,93	38,98	47,32	-
	B+Z	-	25,88	34,76	41,93	45,88	54,22	-
	N	-	2,00	3,00	4,00	4,00	5,00	-
	S	-	3,34	3,86	4,31	4,31	4,73	-
9/16-28 UN	E	-	2,33	7,92	17,18	13,47	20,77	-
	B	-	20,74	29,27	42,68	39,73	48,21	-
	B+Z	-	26,34	35,37	42,68	46,63	55,11	-
	N	-	2,00	3,00	4,00	3,00	5,00	-
	S	-	3,14	3,62	4,05	3,62	4,44	-
9/16-32 UN	E	-	2,31	7,89	17,12	11,69	20,82	-
	B	-	21,10	29,73	43,25	26,79	48,38	-
	B+Z	-	26,70	35,83	43,25	33,69	55,78	-
	N	-	-	3,00	4,00	3,00	5,00	-
	S	-	-	6,23	6,97	6,23	7,63	-
5/8-11 UNC	E	-	-	7,61	16,82	11,46	20,62	-
	B	-	-	30,03	43,75	27,09	49,58	-
	B+Z	-	-	36,13	43,75	33,99	56,48	-
	N	-	2,00	3,00	4,00	3,00	4,00	-
	S	-	5,20	6,00	6,71	6,00	6,71	-
5/8-12 UN	E	-	2,01	7,56	16,72	11,54	18,42	-
	B	-	21,78	30,79	44,67	27,84	36,80	-
	B+Z	-	27,38	36,89	44,67	34,74	43,70	-
	N	-	2,00	-2,00	4,00	3,00	4,00	-
	S	-	4,58	4,58	5,91	5,29	5,91	-
5/8-16 UN	E	-	1,91	6,60	16,41	11,72	18,77	-
	B	-	23,40	18,52	47,25	29,94	39,38	-
	B+Z	-	29,00	24,62	47,25	36,84	46,28	-
	N	-	2,00	-2,00	4,00	3,00	4,00	-
	S	-	4,34	4,34	5,61	5,01	5,61	-
5/8-18 UNF	E	-	1,87	6,60	16,30	11,77	18,87	-
	B	-	23,93	19,05	48,10	30,63	40,23	-
	B+Z	-	29,53	25,15	48,10	37,53	47,13	-
	N	-	2,00	-2,00	4,00	3,00	4,00	-
	S	-	4,13	4,13	5,33	4,77	5,33	-
5/8-20 UN	E	-	1,83	6,60	16,20	11,81	18,96	-
	B	-	24,38	19,50	48,82	31,22	40,94	-
	B+Z	-	29,98	25,60	48,82	38,12	47,84	-
	N	-	2,00	2,00	4,00	3,00	4,00	-
	S	-	3,80	3,80	4,90	4,38	4,90	-
5/8-24 UNEF	E	-	1,78	6,60	16,05	11,86	19,07	-
	B	-	25,04	20,16	49,86	32,06	41,99	-
	B+Z	-	30,64	26,26	49,86	38,96	48,89	-
	N	-	2,00	2,00	4,00	3,00	4,00	-
	S	-	3,53	3,53	4,56	4,08	4,56	-
5/8-28 UN	E	-	1,73	6,60	15,94	11,90	19,15	-
	B	-	25,50	20,63	50,61	32,67	42,74	-
	B+Z	-	31,10	26,73	50,61	39,57	49,64	-
	N	-	2,00	2,00	4,00	3,00	4,00	-
	S	-	3,32	3,32	4,28	3,83	4,28	-
5/8-32 UN	E	-	1,70	6,60	15,86	11,92	19,20	-
	B	-	25,85	20,97	51,16	33,12	43,29	-
	B+Z	-	31,45	27,07	51,16	40,02	50,19	-

UST-Threads

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	-	2,00	2,00	4,00	3,00	4,00	-
	S	-	5,49	5,49	7,08	6,34	7,08	-
11/16-12 UN	E	-	1,36	6,32	15,38	11,71	19,09	-
	B	-	26,55	21,67	52,61	34,19	44,74	-
	B+Z	-	32,15	27,77	52,61	41,09	51,64	-
	N	-	-	2,00	3,00	3,00	4,00	-
	S	-	-	4,83	5,57	5,57	6,23	-
11/16-16 UN	E	-	-	6,28	15,89	11,78	19,29	-
	B	-	-	23,29	39,24	36,29	47,32	-
	B+Z	-	-	29,39	39,24	43,19	54,22	-
	N	-	-	2,00	3,00	3,00	4,00	-
	S	-	-	4,35	5,03	5,03	5,62	-
11/16-20 UN	E	-	-	6,24	15,77	11,81	19,39	-
	B	-	-	24,27	40,51	37,57	48,88	-
	B+Z	-	-	30,37	40,51	44,47	55,78	-
	N	-	-	2,00	3,00	3,00	4,00	-
	S	-	-	4,00	4,62	4,62	5,16	-
11/16-24 UNEF	E	-	-	6,21	15,68	11,82	19,45	-
	B	-	-	24,92	41,36	38,41	49,92	-
	B+Z	-	-	31,02	41,36	45,31	56,82	-
	N	-	-	2,00	3,00	3,00	4,00	-
	S	-	-	3,72	4,29	4,29	4,80	-
11/16-28 UN	E	-	-	6,18	15,61	11,82	19,49	-
	B	-	-	25,39	41,97	39,02	50,67	-
	B+Z	-	-	31,49	41,97	45,92	57,57	-
	N	-1,00	-	2,00	3,00	3,00	4,00	-
	S	2,85	-	3,49	4,02	4,02	4,50	-
11/16-32 UN	E	-2,18	-	6,17	15,56	11,82	19,51	-
	B	17,42	-	25,74	42,42	39,47	51,23	-
	B+Z	17,42	-	31,84	42,42	46,37	58,13	-
	N	-	-	2,00	3,00	3,00	4,00	-
	S	-	-	6,23	7,20	7,20	8,05	-
3/4-10 UNC	E	-	-	5,93	15,37	11,56	19,24	-
	B	-	-	25,12	41,79	38,84	50,58	-
	B+Z	-	-	31,22	41,79	45,74	57,48	-
	N	-	-	2,00	3,00	3,00	4,00	-
	S	-	-	5,76	6,65	6,65	7,44	-
3/4-12 UN	E	-	-	5,86	15,18	11,56	19,32	-
	B	-	-	26,42	43,47	40,53	52,65	-
	B+Z	-	-	32,52	43,47	47,43	59,55	-
	N	-	-	2,00	3,00	3,00	3,00	-
	S	-	-	5,06	5,84	5,84	5,84	-
3/4-16 UNF	E	-	-	5,74	14,92	11,52	16,84	-
	B	-	-	28,03	45,57	42,62	37,70	-
	B+Z	-	-	34,13	45,57	49,52	44,60	-
	N	-1,00	-	2,00	3,00	3,00	3,00	-
	S	3,72	-	4,56	5,26	5,26	5,26	-
3/4-20 UNEF	E	-2,70	-	5,66	14,74	11,49	17,00	-
	B	19,56	-	29,03	46,86	43,91	38,98	-
	B+Z	19,56	-	35,13	46,86	50,81	45,88	-
	N	-1,00	-	2,00	3,00	2,00	3,00	-
	S	3,18	-	3,89	4,49	3,89	4,49	-
3/4-28 UN	E	-2,81	-	5,56	14,53	9,43	17,15	-
	B	20,35	-	30,14	48,31	27,20	40,43	-
	B+Z	20,35	-	36,24	48,31	34,10	47,33	-

RANGE TABLES FOR THREAD ROLLING ATTACHMENTS - UST THREADS

UST-Threads

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
3/4-32 UN	N	-1,00	-	2,00	3,00	2,00	3,00	-
	S	2,98	-	3,65	4,21	3,65	4,21	-
	E	-2,84	-	5,52	14,46	9,45	17,20	-
	B	20,60	-	30,50	48,77	27,55	40,89	-
	B+Z	20,60	-	36,60	48,77	34,45	47,79	-
13/16-12 UN	N	-	-	2,00	3,00	2,00	3,00	-
	S	-	-	6,02	6,96	6,02	6,96	-
	E	-	-	5,18	14,03	9,23	17,04	-
	B	-	-	31,18	49,82	28,23	41,95	-
	B+Z	-	-	37,28	49,82	35,13	48,85	-
13/16-16 UN	N	-	-	2,00	3,00	2,00	3,00	-
	S	-	-	5,28	6,10	5,28	6,10	-
	E	-	-	5,00	13,68	9,32	17,22	-
	B	-	-	32,80	51,92	29,85	44,05	-
	B+Z	-	-	38,90	51,92	36,75	50,95	-
13/16-20 UNEF	N	-	-	2,00	3,00	2,00	3,00	-
	S	-	-	4,76	5,50	4,76	5,50	-
	E	-	-	4,87	13,45	9,37	17,31	-
	B	-	-	33,78	53,20	30,84	45,33	-
	B+Z	-	-	39,88	53,20	37,74	52,23	-
13/16-28 UN	N	-	-1,00	2,00	3,00	2,00	3,00	-
	S	-	3,32	4,06	4,69	4,06	4,69	-
	E	-	-0,90	4,72	13,18	9,41	17,40	-
	B	-	20,03	34,90	54,66	31,96	46,78	-
	B+Z	-	25,63	41,00	54,66	38,86	53,68	-
13/16-32 UN	N	-	-1,00	2,00	3,00	2,00	3,00	-
	S	-	3,10	3,80	4,39	3,80	4,39	-
	E	-	-0,92	4,67	13,09	9,43	17,43	-
	B	-	20,28	35,26	55,00	32,31	47,24	-
	B+Z	-	25,88	41,36	55,00	39,21	54,14	-
7/8-9 UNC	N	-	-	-	-	2,00	3,00	-
	S	-	-	-	-	7,12	8,23	-
	E	-	-	-	-	9,10	17,06	-
	B	-	-	-	-	30,83	45,49	-
	B+Z	-	-	-	-	37,73	52,39	-
7/8-12 UN	N	-	-	2,00	3,00	2,00	3,00	-
	S	-	-	6,27	7,25	6,27	7,25	-
	E	-	-	4,30	12,62	9,18	17,22	-
	B	-	-	35,94	56,00	33,00	48,30	-
	B+Z	-	-	42,04	56,00	39,90	55,20	-
7/8-14 UNF	N	-	-	-	3,00	2,00	3,00	-
	S	-	-	-	6,75	5,85	6,75	-
	E	-	-	-	12,37	9,20	17,28	-
	B	-	-	-	56,00	33,91	49,49	-
	B+Z	-	-	-	56,00	40,81	56,39	-
7/8-16 UN	N	-	-	-	2,00	2,00	3,00	-
	S	-	-	-	5,50	5,50	6,35	-
	E	-	-	-	13,51	9,21	17,31	-
	B	-	-	-	37,56	34,62	50,40	-
	B+Z	-	-	-	37,56	41,52	57,30	-
7/8-20 UNEF	N	-	-1,00	-	2,00	2,00	3,00	-
	S	-	4,04	-	4,95	4,95	5,71	-
	E	-	-1,42	-	13,40	9,22	17,35	-
	B	-	22,42	-	38,55	35,60	51,68	-
	B+Z	-	28,02	-	38,55	42,50	58,58	-

UST-Threads

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
7/8-28 UN	N	-	-1,00	-	2,00	2,00	3,00	-
	S	-	3,44	-	4,22	4,22	4,87	-
	E	-	-1,51	-	13,27	9,22	17,38	-
	B	-	23,21	-	39,67	36,72	53,13	-
	B+Z	-	28,81	-	39,67	43,62	60,03	-
7/8-32 UN	N	-	-1,00	-	2,00	2,00	3,00	-
	S	-	3,23	-	3,95	3,95	4,56	-
	E	-	-1,54	-	13,23	9,21	17,38	-
	B	-	23,46	-	40,02	37,08	53,59	-
	B+Z	-	29,06	-	40,02	43,98	60,49	-
15/16-12 UN	N	-	-	-	2,00	2,00	3,00	-
	S	-	-	-	6,52	6,52	7,52	-
	E	-	-	-	12,88	8,94	17,14	-
	B	-	-	-	40,70	37,75	54,64	-
	B+Z	-	-	-	40,70	44,65	61,54	-
15/16-16 UN	N	-	-1,00	-	2,00	2,00	3,00	-
	S	-	4,66	-	5,71	5,71	6,59	-
	E	-	-2,01	-	12,66	8,91	17,14	-
	B	-	24,90	-	42,32	39,37	56,74	-
	B+Z	-	30,50	-	42,32	46,27	63,64	-
15/16-20 UNEF	N	-	-1,00	-	2,00	2,00	3,00	-
	S	-	4,19	-	5,13	5,13	5,92	-
	E	-	-2,11	-	12,52	8,88	17,13	-
	B	-	25,59	-	43,30	40,36	58,02	-
	B+Z	-	31,19	-	43,30	47,26	64,92	-
15/16-28 UN	N	-	-1,00	-	2,00	2,00	3,00	-
	S	-	3,57	-	4,37	4,37	5,05	-
	E	-	-2,23	-	12,36	8,84	17,10	-
	B	-	26,38	-	44,42	41,48	59,47	-
	B+Z	-	31,98	-	44,42	48,38	66,37	-
15/16-32 UN	N	-	-1,00	-	2,00	2,00	2,00	-
	S	-	3,34	-	4,10	4,10	4,10	-
	E	-	-2,26	-	12,30	8,82	14,03	-
	B	-	26,63	-	44,78	41,83	36,90	-
	B+Z	-	32,23	-	44,78	48,73	43,80	-
1-8 UNC	N	-	-	-	-	2,00	3,00	-
	S	-	-	-	-	8,09	9,35	-
	E	-	-	-	-	8,64	16,88	-
	B	-	-	-	-	39,27	56,78	-
	B+Z	-	-	-	-	46,17	63,68	-
1-12 UNF	N	-	-1,00	-	2,00	2,00	2,00	-
	S	-	5,51	-	6,75	6,75	6,75	-
	E	-	-2,61	-	11,93	8,52	13,82	-
	B	-	26,92	-	45,44	42,50	37,57	-
	B+Z	-	32,52	-	45,44	49,40	44,47	-
1-16 UN	N	-	-	-	2,00	2,00	2,00	-
	S	-	-	-	5,91	5,91	5,91	-
	E	-	-	-	11,66	8,43	13,97	-
	B	-	-	-	47,08	44,14	39,21	-
	B+Z	-	-	-	47,08	51,04	46,11	-
1-20 UNEF	N	-	-	-	2,00	2,00	2,00	-
	S	-	-	-	5,31	5,31	5,31	-
	E	-	-	-	11,49	8,37	14,05	-
	B	-	-	-	48,06	45,12	40,19	-
	B+Z	-	-	-	48,06	52,02	47,09	-

RANGE TABLES FOR THREAD ROLLING ATTACHMENTS - UST THREADS

UST-Threads

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	-	-	-1,00	2,00	2,00	2,00	-
	S	-	-	3,69	4,52	4,52	4,52	-
1-28 UN	E	-	-	2,18	11,29	8,29	14,14	-
	B	-	-	24,67	49,19	46,24	41,31	-
	B+Z	-	-	30,77	49,19	53,14	48,21	-
	N	-	-	-1,00	2,00	2,00	2,00	-
	S	-	-	3,46	4,23	4,23	4,23	-
1-32 UN	E	-	-	2,15	11,23	8,26	14,16	-
	B	-	-	24,92	49,54	46,59	41,67	-
	B+Z	-	-	31,02	49,54	43,49	48,57	-
	N	-	-	-	-	2,00	2,00	-
	S	-	-	-	-	8,38	8,38	-
1 1/16-8 UN	E	-	-	-	-	8,17	13,69	-
	B	-	-	-	-	44,04	39,11	-
	B+Z	-	-	-	-	50,94	46,01	-
	N	-	-	-	2,00	2,00	2,00	-
	S	-	-	-	6,97	6,97	6,97	-
1 1/16-12 UN	E	-	-	-	10,83	7,93	13,94	-
	B	-	-	-	50,22	47,28	42,35	-
	B+Z	-	-	-	50,22	54,18	49,25	-
	N	-	-	-	2,00	2,00	2,00	-
	S	-	-	-	6,10	6,10	6,10	-
1 1/16-16 UN	E	-	-	-	10,51	7,79	14,03	-
	B	-	-	-	51,85	48,90	43,97	-
	B+Z	-	-	-	51,85	55,80	50,87	-
	N	-	-	-1,00	2,00	2,00	2,00	-
	S	-	-	4,71	5,77	5,77	5,77	-
1 1/16-18 UNEF	E	-	-	1,66	10,40	7,73	14,06	-
	B	-	-	26,76	52,39	49,45	44,52	-
	B+Z	-	-	32,86	52,39	56,35	51,42	-
	N	-	-	-1,00	2,00	2,00	2,00	-
	S	-	-	4,47	5,48	5,48	5,48	-
1 1/16-20 UN	E	-	-	1,63	10,31	7,69	14,08	-
	B	-	-	27,06	52,83	49,88	44,95	-
	B+Z	-	-	33,16	52,83	56,78	51,85	-
	N	-	-	-1,00	2,00	2,00	2,00	-
	S	-	-	3,81	4,67	4,67	4,67	-
1 1/16-28 UN	E	-	-	1,54	10,08	7,57	14,12	-
	B	-	-	27,85	53,95	50,00	46,07	-
	B+Z	-	-	33,95	53,95	56,90	52,97	-
	N	-	-	-	-	2,00	2,00	-
	S	-	-	-	-	8,65	8,65	-
1 1/8-8 UN	E	-	-	-	-	7,53	13,75	-
	B	-	-	-	-	48,79	43,86	-
	B+Z	-	-	-	-	55,69	50,76	-
	N	-	-	-	2,00	2,00	2,00	-
	S	-	-	-	7,19	7,19	7,19	-
1 1/8-12 UNF	E	-	-	-	9,59	7,18	13,89	-
	B	-	-	-	54,97	50,00	47,09	-
	B+Z	-	-	-	54,97	56,90	53,99	-
	N	-	-	-1,00	2,00	2,00	2,00	-
	S	-	-	5,13	6,29	6,29	6,29	-
1 1/8-16 UN	E	-	-	1,02	9,21	6,97	13,93	-
	B	-	-	29,55	56,00	50,00	48,74	-
	B+Z	-	-	35,65	56,00	56,90	55,64	-

UST-Threads

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	-	-	-1,00	2,00	2,00	2,00	-
	S	-	-	5,63	6,89	6,89	6,89	-
1 1/8-18 UNEF	E	-	-	0,96	9,15	6,91	13,87	-
	B	-	-	29,53	56,00	50,00	48,76	-
	B+Z	-	-	35,63	56,00	56,90	55,66	-
	N	-	-	-1,00	2,00	-1,00	2,00	-
	S	-	-	4,61	5,65	4,61	5,65	-
1 1/8-20 UN	E	-	-	0,92	8,98	4,81	13,94	-
	B	-	-	30,24	56,00	27,29	49,71	-
	B+Z	-	-	36,34	56,00	34,19	56,61	-
	N	-	-	-1,00	2,00	-1,00	2,00	-
	S	-	-	3,92	4,80	3,92	4,80	-
1 1/8-28 UN	E	-	-	0,80	8,71	4,82	13,95	-
	B	-	-	31,02	57,00	28,08	50,84	-
	B+Z	-	-	37,12	57,00	34,98	57,74	-
	N	-	-	-	-	-	2,00	-
	S	-	-	-	-	-	8,91	-
1 3/16-8 UN	E	-	-	-	-	-	13,76	-
	B	-	-	-	-	-	48,62	-
	B+Z	-	-	-	-	-	55,52	-
	N	-	-	-1,00	2,00	-1,00	2,00	-
	S	-	-	6,05	7,41	6,05	7,41	-
1 3/16-12 UN	E	-	-	0,52	8,28	4,64	13,79	-
	B	-	-	31,58	57,00	28,63	51,87	-
	B+Z	-	-	37,68	57,00	35,53	58,77	-
	N	-	-	-1,00	-	-1,00	2,00	-
	S	-	-	5,28	-	5,28	6,47	-
1 3/16-16 UN	E	-	-	0,34	-	4,65	13,78	-
	B	-	-	32,72	-	29,77	53,49	-
	B+Z	-	-	38,82	-	36,67	60,39	-
	N	-	-	-1,00	-	-1,00	2,00	-
	S	-	-	4,99	-	4,99	6,12	-
1 3/16-18 UNEF	E	-	-	0,28	-	4,65	13,77	-
	B	-	-	33,10	-	30,15	54,03	-
	B+Z	-	-	39,20	-	37,05	60,93	-
	N	-	-	-1,00	-	-1,00	2,00	-
	S	-	-	4,74	-	4,74	5,81	-
1 3/16-20 UN	E	-	-	0,22	-	4,66	13,77	-
	B	-	-	33,41	-	30,46	54,47	-
	B+Z	-	-	39,51	-	37,36	61,37	-
	N	-	-	1,00	1,00	-1,00	2,00	-
	S	-	-	4,03	4,03	4,03	4,94	-
1 3/16-28 UN	E	-	-	0,08	9,37	4,65	13,74	-
	B	-	-	34,20	34,20	31,25	55,60	-
	B+Z	-	-	40,30	34,20	38,15	62,50	-
	N	-	-	-	-	-	2,00	-
	S	-	-	-	-	-	9,17	-
1 1/4-8 UN	E	-	-	-	-	-	13,51	-
	B	-	-	-	-	-	53,38	-
	B+Z	-	-	-	-	-	60,28	-
	N	-	-	-1,00	-1,00	-1,00	2,00	-
	S	-	-	6,21	6,21	6,21	7,61	-
1 1/4-12 UNF	E	-	-	-0,31	9,00	4,35	13,44	-
	B	-	-	34,74	34,74	31,79	56,61	-
	B+Z	-	-	40,84	34,74	38,69	63,51	-

RANGE TABLES FOR THREAD ROLLING ATTACHMENTS - UST THREADS

UST-Threads

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	-	-	1,00	1,00	-1,00	2,00	2,00
	S	-	-	5,43	5,43	5,43	6,65	6,65
1 1/4-16 UN	E	-	-	-0,54	8,84	4,33	13,38	19,43
	B	-	-	35,90	35,90	32,95	58,26	58,26
	B+Z	-	-	42,00	35,90	39,85	65,16	65,16
	N	-	-	-	1,00	-1,00	2,00	2,00
	S	-	-	-	5,13	5,13	6,28	6,28
1 1/4-18 UNEF	E	-	-	-	8,79	4,32	13,36	19,49
	B	-	-	-	36,27	33,33	58,79	58,79
	B+Z	-	-	-	36,27	40,23	65,69	65,69
	N	-	-	-	1,00	-1,00	2,00	2,00
	S	-	-	-	4,87	4,87	5,97	5,97
1 1/4-20 UN	E	-	-	-	8,74	4,32	13,34	19,53
	B	-	-	-	36,58	33,64	59,23	59,23
	B+Z	-	-	-	36,58	40,54	66,13	66,13
	N	-	-	-	1,00	-1,00	2,00	2,00
	S	-	-	-	4,14	4,14	5,07	5,07
1 1/4-28 UN	E	-	-	-	8,62	4,29	13,28	19,64
	B	-	-	-	37,37	34,42	60,36	60,36
	B+Z	-	-	-	37,37	41,32	67,26	67,26
	N	-	-	-	-	-1,00	2,00	2,00
	S	-	-	-	-	7,69	9,42	9,42
1 5/16-8 UN	E	-	-	-	-	4,04	13,12	19,15
	B	-	-	-	-	32,70	58,14	58,14
	B+Z	-	-	-	-	39,60	65,04	65,04
	N	-	-	-	1,00	-1,00	2,00	2,00
	S	-	-	-	6,38	6,38	7,81	7,81
1 5/16-12 UN	E	-	-	-	8,24	3,98	12,95	19,46
	B	-	-	-	37,93	34,98	61,39	61,39
	B+Z	-	-	-	37,93	41,88	68,29	68,29
	N	-	-	-	1,00	-1,00	2,00	2,00
	S	-	-	-	5,57	5,57	6,82	6,82
1 5/16-16 UN	E	-	-	-	8,06	3,93	12,85	19,58
	B	-	-	-	39,07	36,12	63,02	63,02
	B+Z	-	-	-	39,07	43,02	69,92	69,92
	N	-	-	-	1,00	-1,00	2,00	2,00
	S	-	-	-	5,26	5,26	6,44	6,44
1 5/16-18 UNEF	E	-	-	-	8,00	3,91	12,81	19,62
	B	-	-	-	39,45	36,50	63,55	63,55
	B+Z	-	-	-	39,45	43,40	70,45	70,45
	N	-	-	-	1,00	-1,00	2,00	2,00
	S	-	-	-	4,99	4,99	6,12	6,12
1 5/16-20 UN	E	-	-	-	7,94	3,90	12,78	19,65
	B	-	-	-	39,76	36,81	63,99	63,99
	B+Z	-	-	-	39,76	43,71	70,89	70,89
	N	-	-	-	1,00	-1,00	2,00	2,00
	S	-	-	-	4,25	4,25	5,20	5,20
1 5/16-28 UN	E	-	-	-	7,81	3,85	12,69	19,72
	B	-	-	-	40,55	37,60	65,12	65,12
	B+Z	-	-	-	40,55	44,50	72,02	72,02
	N	-	-	-	-	-1,00	2,00	2,00
	S	-	-	-	-	7,89	9,66	9,66
1 3/8-8 UN	E	-	-	-	-	3,65	12,59	19,30
	B	-	-	-	-	35,87	62,89	62,89
	B+Z	-	-	-	-	42,77	69,79	69,79

UST-Threads

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	-	-	-	1,00	-1,00	2,00	2,00
	S	-	-	-	6,53	6,53	8,00	8,00
1 3/8-12 UNF	E	-	-	-	7,42	3,53	12,33	19,51
	B	-	-	-	41,08	38,14	66,12	66,12
	B+Z	-	-	-	41,08	45,04	73,02	73,02
	N	-	-	-	1,00	-1,00	2,00	2,00
	S	-	-	-	5,70	5,70	6,99	6,99
1 3/8-16 UN	E	-	-	-	7,21	3,45	12,18	19,59
	B	-	-	-	42,25	39,30	67,00	67,78
	B+Z	-	-	-	42,25	46,20	73,90	74,68
	N	-	-	-	1,00	-1,00	2,00	2,00
	S	-	-	-	5,39	5,39	6,60	6,60
1 3/8-18 UNEF	E	-	-	-	7,14	3,42	12,12	19,61
	B	-	-	-	42,62	39,68	67,00	68,32
	B+Z	-	-	-	42,62	46,58	73,90	75,22
	N	-	-	-	1,00	-1,00	2,00	2,00
	S	-	-	-	5,12	5,12	6,27	6,27
1 3/8-20 UN	E	-	-	-	7,08	3,40	12,08	19,63
	B	-	-	-	42,93	39,99	67,00	68,76
	B+Z	-	-	-	42,93	46,89	73,90	75,66
	N	-	-	-	1,00	-1,00	2,00	2,00
	S	-	-	-	4,35	4,35	5,33	5,33
1 3/8-28 UN	E	-	-	-	6,93	3,33	11,96	19,66
	B	-	-	-	43,72	40,77	67,00	69,88
	B+Z	-	-	-	43,72	47,67	73,90	76,78
	N	-	-	-	-	-1,00	2,00	2,00
	S	-	-	-	-	8,08	9,90	9,90
1 7/16-8 UN	E	-	-	-	-	3,17	11,92	19,31
	B	-	-	-	-	39,04	67,00	67,65
	B+Z	-	-	-	-	45,94	73,90	74,55
	N	-	-	-	1,00	-1,00	-1,00	-
	S	-	-	-	6,69	6,69	6,69	-
1 7/16-12 UN	E	-	-	-	6,53	2,99	8,12	-
	B	-	-	-	44,27	41,33	36,40	-
	B+Z	-	-	-	44,27	48,23	43,30	-
	N	-	-	-	1,00	-1,00	-1,00	-
	S	-	-	-	5,84	5,84	5,84	-
1 7/16-16 UN	E	-	-	-	6,30	2,89	8,19	-
	B	-	-	-	45,41	42,47	37,54	-
	B+Z	-	-	-	45,41	49,37	44,44	-
	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	5,52	5,52	5,52	-
1 7/16-18 UNEF	E	-	-	-	6,22	2,85	8,20	-
	B	-	-	-	45,79	42,85	37,92	-
	B+Z	-	-	-	45,79	49,75	44,82	-
	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	5,23	5,23	5,23	-
1 7/16-20 UN	E	-	-	-	6,15	2,82	8,22	-
	B	-	-	-	46,10	43,16	38,23	-
	B+Z	-	-	-	46,10	50,06	45,13	-
	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	4,45	4,45	4,45	-
1 7/16-28 UN	E	-	-	-	5,99	2,74	8,25	-
	B	-	-	-	46,89	43,94	39,01	-
	B+Z	-	-	-	46,89	50,84	45,91	-

RANGE TABLES FOR THREAD ROLLING ATTACHMENTS - UST THREADS

UST-Threads

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	-	-	-	-	-1,00	-1,00	-
	S	-	-	-	-	8,27	8,27	-
1 1/2-8 UN	E	-	-	-	-	2,62	7,88	-
	B	-	-	-	-	42,21	37,29	-
	B+Z	-	-	-	-	49,11	44,19	-
	N	-	-	-	1,00	-1,00	-1,00	-
	S	-	-	-	6,84	6,84	6,84	-
1 1/2-12 UNF	E	-	-	-	5,58	2,39	7,98	-
	B	-	-	-	47,43	44,48	39,56	-
	B+Z	-	-	-	47,43	51,38	46,46	-
	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	5,97	5,97	5,97	-
1 1/2-16 UN	E	-	-	-	5,32	2,25	8,01	-
	B	-	-	-	48,59	45,64	40,71	-
	B+Z	-	-	-	48,59	52,54	47,61	-
	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	5,64	5,64	5,64	-
1 1/2-18 UNEF	E	-	-	-	5,23	2,21	8,02	-
	B	-	-	-	48,97	46,02	41,10	-
	B+Z	-	-	-	48,97	52,92	48,00	-
	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	5,35	5,35	5,35	-
1 1/2-20 UN	E	-	-	-	5,16	2,17	8,03	-
	B	-	-	-	49,28	46,33	51,40	-
	B+Z	-	-	-	49,28	53,23	48,30	-
	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	4,55	4,55	4,55	-
1 1/2-28 UN	E	-	-	-	4,98	2,07	8,05	-
	B	-	-	-	50,06	47,12	42,19	-
	B+Z	-	-	-	50,06	54,02	49,09	-
	N	-	-	-	-	-1,00	-1,00	-
	S	-	-	-	-	8,45	8,45	-
1 9/16-8 UN	E	-	-	-	-	1,99	7,71	-
	B	-	-	-	-	45,39	40,46	-
	B+Z	-	-	-	-	52,29	47,36	-
	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	6,99	6,99	6,99	-
1 9/16-12 UN	E	-	-	-	4,55	1,70	7,76	-
	B	-	-	-	50,62	47,68	42,75	-
	B+Z	-	-	-	50,62	54,58	49,65	-
	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	6,10	6,10	6,10	-
1 9/16-16 UN	E	-	-	-	4,28	1,54	7,77	-
	B	-	-	-	51,76	48,82	43,89	-
	B+Z	-	-	-	51,76	55,72	50,79	-
	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	5,76	5,76	5,76	-
E 1 9/16-18 UNEF	E	-	-	-	4,18	1,49	7,77	-
	B	-	-	-	52,14	49,20	44,27	-
	B+Z	-	-	-	52,14	56,10	51,17	-
	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	5,46	5,46	5,46	-
1 9/16-20 UN	E	-	-	-	4,10	1,44	7,77	-
	B	-	-	-	52,45	49,51	44,58	-
	B+Z	-	-	-	52,45	56,41	51,48	-

UST-Threads

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	-	-	-	-	1,00	-1,00	-
	S	-	-	-	-	8,63	8,63	-
1 5/8-8 UN	E	-	-	-	-	1,28	7,47	-
	B	-	-	-	-	48,56	43,63	-
	B+Z	-	-	-	-	55,45	50,53	-
	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	7,14	7,14	7,14	-
1 5/8-12 UN	E	-	-	-	3,46	0,94	7,47	-
	B	-	-	-	53,80	50,00	45,92	-
	B+Z	-	-	-	53,80	56,90	52,82	-
	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	6,22	6,22	6,22	-
1 5/8-16 UN	E	-	-	-	3,16	0,75	7,46	-
	B	-	-	-	54,94	50,00	47,06	-
	B+Z	-	-	-	54,94	56,90	53,96	-
	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	5,88	5,88	5,88	-
1 5/8-18 UNEF	E	-	-	-	3,06	0,69	7,45	-
	B	-	-	-	55,00	50,00	47,45	-
	B+Z	-	-	-	55,00	56,90	54,35	-
	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	5,58	5,58	5,58	-
1 5/8-20 UN	E	-	-	-	2,98	0,64	7,44	-
	B	-	-	-	55,00	50,00	47,75	-
	B+Z	-	-	-	55,00	56,90	54,65	-
	N	-	-	-	-	1,00	-1,00	-
	S	-	-	-	-	8,81	8,81	-
1 11/16-8 UN	E	-	-	-	-	0,50	7,16	-
	B	-	-	-	-	50,00	46,81	-
	B+Z	-	-	-	-	56,90	53,71	-
	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	7,28	7,28	7,28	-
1 11/16-12 UN	E	-	-	-	2,31	0,11	7,11	-
	B	-	-	-	56,00	50,00	49,10	-
	B+Z	-	-	-	56,00	56,90	56,00	-
	N	-	-	-	1,00	1,00	-1,00	-
	S	-	-	-	6,34	6,34	6,34	-
1 11/16-16 UN	E	-	-	-	1,99	-0,11	7,08	-
	B	-	-	-	57,00	50,00	50,24	-
	B+Z	-	-	-	57,00	56,90	57,14	-
	N	-	-	-	1,00	-	-1,00	-
	S	-	-	-	5,99	-	5,99	-
1 11/16-18 UNEF	E	-	-	-	1,87	-	7,06	-
	B	-	-	-	57,00	-	50,62	-
	B+Z	-	-	-	57,00	-	57,52	-
	N	-	-	-	1,00	-	-1,00	-
	S	-	-	-	5,69	-	5,69	-
1 11/16-20 UN	E	-	-	-	1,79	-	7,05	-
	B	-	-	-	57,00	-	50,92	-
	B+Z	-	-	-	57,00	-	57,82	-
	N	-	-	-	-	1,00	-1,00	-
	S	-	-	-	-	8,99	8,99	-
1 3/4-8 UN	E	-	-	-	-	-0,35	6,79	-
	B	-	-	-	-	50,00	49,98	-
	B+Z	-	-	-	-	56,90	56,88	-

RANGE TABLES FOR THREAD ROLLING ATTACHMENTS - UST THREADS

UST-Threads

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	-	-	-	1,00	-	-1,00	-
	S	-	-	-	7,42	-	7,42	-
1 3/4-12 UN	E	-	-	-	1,09	-	6,69	-
	B	-	-	-	58,00	-	52,27	-
	B+Z	-	-	-	58,00	-	59,17	-
	N	-	-	-	-	-	1,00	-
	S	-	-	-	-	-	6,47	-
1 3/4-16 UN	E	-	-	-	-	-	6,63	-
	B	-	-	-	-	-	53,41	-
	B+Z	-	-	-	-	-	60,31	-
	N	-	-	-	-	-	1,00	-
	S	-	-	-	-	-	5,79	-
1 3/4-20 UN	E	-	-	-	-	-	6,59	-
	B	-	-	-	-	-	54,10	-
	B+Z	-	-	-	-	-	61,00	-
	N	-	-	-	-	-	-1,00	-
	S	-	-	-	-	-	9,16	-
1 13/16-8 UN	E	-	-	-	-	-	6,35	-
	B	-	-	-	-	-	53,15	-
	B+Z	-	-	-	-	-	60,05	-
	N	-	-	-	-	-	1,00	-
	S	-	-	-	-	-	7,56	-
1 13/16-12 UN	E	-	-	-	-	-	6,20	-
	B	-	-	-	-	-	55,45	-
	B+Z	-	-	-	-	-	62,35	-
	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	6,58	6,58
1 13/16-16 UN	E	-	-	-	-	-	6,12	11,92
	B	-	-	-	-	-	56,59	56,59
	B+Z	-	-	-	-	-	63,49	63,49
	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	5,90	5,90
1 13/16-20 UN	E	-	-	-	-	-	6,06	11,97
	B	-	-	-	-	-	57,27	57,27
	B+Z	-	-	-	-	-	64,17	64,17
	N	-	-	-	-	-	-1,00	-1,00
	S	-	-	-	-	-	9,32	9,32
1 7/8-8 UN	E	-	-	-	-	-	5,84	11,61
	B	-	-	-	-	-	56,32	56,32
	B+Z	-	-	-	-	-	63,22	63,22
	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	7,69	7,69
1 7/8-12 UN	E	-	-	-	-	-	5,65	11,75
	B	-	-	-	-	-	58,62	58,62
	B+Z	-	-	-	-	-	65,52	65,52
	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	6,70	6,70
1 7/8-16 UN	E	-	-	-	-	-	5,55	11,81
	B	-	-	-	-	-	59,76	59,76
	B+Z	-	-	-	-	-	66,66	66,66
	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	6,00	6,00
1 7/8-20 UN	E	-	-	-	-	-	5,48	11,84
	B	-	-	-	-	-	60,45	60,45
	B+Z	-	-	-	-	-	67,35	67,35

UST-Threads

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	9,49	9,49
1 15/16-8 UN	E	-	-	-	-	-	5,28	11,50
	B	-	-	-	-	-	59,50	59,50
	B+Z	-	-	-	-	-	66,40	66,40
	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	7,83	7,83
1 15/16-12 UN	E	-	-	-	-	-	5,04	11,60
	B	-	-	-	-	-	61,79	61,79
	B+Z	-	-	-	-	-	68,69	68,69
	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	6,81	6,81
1 15/16-16 UN	E	-	-	-	-	-	4,91	11,63
	B	-	-	-	-	-	62,93	62,93
	B+Z	-	-	-	-	-	69,83	69,83
	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	6,11	6,11
1 15/16-20 UN	E	-	-	-	-	-	4,83	11,65
	B	-	-	-	-	-	63,62	63,62
	B+Z	-	-	-	-	-	70,52	70,52
	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	9,65	9,65
2-8 UN	E	-	-	-	-	-	4,65	11,33
	B	-	-	-	-	-	62,67	62,67
	B+Z	-	-	-	-	-	69,57	69,57
	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	7,96	7,96
2-12 UN	E	-	-	-	-	-	4,37	11,38
	B	-	-	-	-	-	64,97	64,97
	B+Z	-	-	-	-	-	71,87	71,87
	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	6,93	6,93
2-16 UN	E	-	-	-	-	-	4,22	11,39
	B	-	-	-	-	-	66,11	66,11
	B+Z	-	-	-	-	-	73,01	73,01
	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	6,20	6,20
2-20 UN	E	-	-	-	-	-	4,12	11,39
	B	-	-	-	-	-	66,80	66,80
	B+Z	-	-	-	-	-	73,70	73,70
	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	9,96	9,96
2 1/8-8 UN	E	-	-	-	-	-	3,21	10,79
	B	-	-	-	-	-	67,00	69,01
	B+Z	-	-	-	-	-	73,90	75,91
	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	8,21	8,21
2 1/8-12 UN	E	-	-	-	-	-	2,84	10,75
	B	-	-	-	-	-	67,00	71,32
	B+Z	-	-	-	-	-	73,90	78,22
	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	7,15	7,15
2 1/8-16 UN	E	-	-	-	-	-	2,64	10,71
	B	-	-	-	-	-	67,00	72,46
	B+Z	-	-	-	-	-	73,90	79,36

RANGE TABLES FOR THREAD ROLLING ATTACHMENTS - UST THREADS

UST-Threads

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
2 1/8-20 UN	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	6,40	6,40
	E	-	-	-	-	-	2,52	10,69
	B	-	-	-	-	-	67,00	73,15
	B+Z	-	-	-	-	-	73,90	80,05
2 1/4-8 UN	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	10,27	10,27
	E	-	-	-	-	-	1,52	10,00
	B	-	-	-	-	-	67,00	75,36
	B+Z	-	-	-	-	-	73,90	82,26
2 1/4-12 UN	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	3,46	8,46
	E	-	-	-	-	-	1,07	9,87
	B	-	-	-	-	-	67,00	77,67
	B+Z	-	-	-	-	-	73,90	84,57
2 1/4-16 UN	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	7,36	7,36
	E	-	-	-	-	-	0,83	9,80
	B	-	-	-	-	-	67,00	78,00
	B+Z	-	-	-	-	-	73,90	84,90
2 1/4-20 UN	N	-	-	-	-	-	1,00	1,00
	S	-	-	-	-	-	6,59	6,59
	E	-	-	-	-	-	0,68	9,75
	B	-	-	-	-	-	67,00	78,00
	B+Z	-	-	-	-	-	73,90	84,90
2 3/8-8 UN	N	-	-	-	-	-	-	1,00
	S	-	-	-	-	-	-	10,57
	E	-	-	-	-	-	-	8,99
	B	-	-	-	-	-	-	78,00
	B+Z	-	-	-	-	-	-	84,90
2 3/8-12 UN	N	-	-	-	-	-	-	1,00
	S	-	-	-	-	-	-	8,70
	E	-	-	-	-	-	-	8,78
	B	-	-	-	-	-	-	78,00
	B+Z	-	-	-	-	-	-	84,90
2 3/8-16 UN	N	-	-	-	-	-	-	1,00
	S	-	-	-	-	-	-	7,57
	E	-	-	-	-	-	-	8,66
	B	-	-	-	-	-	-	78,00
	B+Z	-	-	-	-	-	-	84,90
2 3/8-20 UN	N	-	-	-	-	-	-	1,00
	S	-	-	-	-	-	-	6,77
	E	-	-	-	-	-	-	8,59
	B	-	-	-	-	-	-	78,00
	B+Z	-	-	-	-	-	-	84,90
2 1/2-8 UN	N	-	-	-	-	-	-	1,00
	S	-	-	-	-	-	-	10,85
	E	-	-	-	-	-	-	7,75
	B	-	-	-	-	-	-	78,00
	B+Z	-	-	-	-	-	-	84,90
2 1/2-12 UN	N	-	-	-	-	-	-	1,00
	S	-	-	-	-	-	-	8,93
	E	-	-	-	-	-	-	7,46
	B	-	-	-	-	-	-	78,00
	B+Z	-	-	-	-	-	-	84,90

UST-Threads

Thread desig.		B 8-W	B 10-W	B 13-W	B 15-W	B 18-W	B 36-W	B 44-W
2 1/2-16 UN	N	-	-	-	-	-	-	1,00
	S	-	-	-	-	-	-	7,77
	E	-	-	-	-	-	-	7,31
	B	-	-	-	-	-	-	78,00
	B+Z	-	-	-	-	-	-	84,90
2 1/2-20 UN	N	-	-	-	-	-	-	1,00
	S	-	-	-	-	-	-	6,95
	E	-	-	-	-	-	-	7,21
	B	-	-	-	-	-	-	78,00
	B+Z	-	-	-	-	-	-	84,90
2 5/8-8 UN	N	-	-	-	-	-	-	1,00
	S	-	-	-	-	-	-	11,14
	E	-	-	-	-	-	-	6,30
	B	-	-	-	-	-	-	78,00
	B+Z	-	-	-	-	-	-	84,90
2 5/8-12 UN	N	-	-	-	-	-	-	1,00
	S	-	-	-	-	-	-	9,16
	E	-	-	-	-	-	-	5,93
	B	-	-	-	-	-	-	78,00
	B+Z	-	-	-	-	-	-	84,90
2 5/8-16 UN	N	-	-	-	-	-	-	1,00
	S	-	-	-	-	-	-	7,97
	E	-	-	-	-	-	-	5,73
	B	-	-	-	-	-	-	78,00
	B+Z	-	-	-	-	-	-	84,90
2 5/8-20 UN	N	-	-	-	-	-	-	1,00
	S	-	-	-	-	-	-	7,13
	E	-	-	-	-	-	-	5,61
	B	-	-	-	-	-	-	78,00
	B+Z	-	-	-	-	-	-	84,90
2 3/4-8 UN	N	-	-	-	-	-	-	1,00
	S	-	-	-	-	-	-	11,41
	E	-	-	-	-	-	-	4,63
	B	-	-	-	-	-	-	78,00
	B+Z	-	-	-	-	-	-	84,90
2 3/4-12 UN	N	-	-	-	-	-	-	1,00
	S	-	-	-	-	-	-	9,38
	E	-	-	-	-	-	-	4,18
	B	-	-	-	-	-	-	78,00
	B+Z	-	-	-	-	-	-	84,90
2 3/4-16 UN	N	-	-	-	-	-	-	1,00
	S	-	-	-	-	-	-	8,16
	E	-	-	-	-	-	-	3,94
	B	-	-	-	-	-	-	78,00
	B+Z	-	-	-	-	-	-	84,90
2 3/4-20 UN	N	-	-	-	-	-	-	1,00
	S	-	-	-	-	-	-	7,30
	E	-	-	-	-	-	-	3,80
	B	-	-	-	-	-	-	78,00
	B+Z	-	-	-	-	-	-	84,90